THE

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ELECTRICAL REVIEW.

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THE
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(J. A. BERLY'S).

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ELECTRICITY IN MINING.

THE Exhibition of Colliery Machinery now being held in Olympia is the fourth since the year 1903, which fact is sufficient to show that old methods of mining, wherein hand labour was predominant, are rapidly giving place to mining by machinery. It is instructive to visit first the model of the tin mine, where two men are engaged in drilling a hole, one holding the drill while the other taps it with a hammer, and to take note of the time occupied in the process. If we next inspect the many exhibits of rock drills, several of which are shown in operation on huge blocks of stone, the enormous saving of time and labour is at once apparent.

The rock drill and the coal-cutter are the golden keys which unlock the mineral wealth in our mines, and while the visitor is struck with the number of rock drills, all driven by compressed air, he also has brought strongly before him the fact that coal-cutters are mostly electrically-driven, and that even the compressors for generating the compressed air for the "rock drills" are being turned by a little insignificant electro-motor attached to the compressor. But probably the most striking feature of the Exhibition, showing the adaptability and cleanliness of electric driving, lies in the number of small motors employed to temporarily turn almost every piece of machinery that is in operation.

There can be no doubt that in the near future electricity will play a large part in the development of the mining industry, and more especially in the coal mines of our own country. As the mines become deeper, necessitating a greater expenditure of capital in sinking shafts and erecting machinery to haul and wind the coal, it is absolutely necessary to reduce the cost of operation, and the most economical means of transmitting and utilising power is by electricity, and it is to the extended use of electrical machinery, both underground and on the surface, that we must look to combat the labour difficulties, and the enhanced price of coal, that must arise on the passing of the "Eight Hours Bill" into law.

For many years electricity has been applied to pumping, hauling, lighting, and coal-cutting, and in very many cases enormous saving has resulted, and in the near future we may expect to see small motors taking the place of horses and ponies now used to haul the coal between the coal-face and the main haulage roads. Already it is being utilised to convey the coal along the face and load it into the tubs or wagons, and there would appear to be a wide field for development in this section of mining. Further, in regard to ventilation, electricity is now being used for driving small underground fans, for the purpose of "boosting" the air, along passages and into workings which otherwise could not be worked.

Turning next to plant on the surface, we now usually find electric lighting and electric driving applied to screening

and washing machinery, driving the various machine tools in the workshops and elsewhere, where it would otherwise be necessary to transmit steam with all its attendant difficulty with joints and condensation losses. Electric winding—judging from the winders already or now being installed—is also beginning to find favour, and there is no reason to think that this will not be the winder of the future, as the tendency is to increase the size of the central power plant put down at either an individual colliery, or in connection with a group of collieries. By increasing the load-factor the cost of generation is lowered, and the addition of the winder greatly helps in this respect. The result is that though the initial cost of the winder may be higher than that of a steam winder, the cost per horse-power may be so reduced as to warrant the extra expenditure of capital.

The only thing that electricity will not do satisfactorily, is to work a percussive rock drill; this, however, may come in time. In the meantime electrically-driven air compressors are being placed underground close to the work to be done by the air-driven rock drill, and the latest development in this respect is to place a small electrically-driven air compressor close to the drill and connect them with a pair of flexible air tubes, so that the air pulsates backwards and forwards between the two cylinders. Though this arrangement—already on the market—is still in the experimental stage, the saving in the consumption of power is something like 50 to 70 per cent., and it is not improbable that at no distant date the present air-driven drill will give place to one combined with an electric motor.

With the introduction of delicate and complicated machinery, it is necessary that the education of the miner and the mining official be attended to, as it is useless to expect good results if the persons in charge of the plant are not skilled in its employment. With continued use, however, this will follow in the natural order of things, and though during the transition stage—as we may call the present period—accidents will occur, and difficulties crop up, we have no hesitation in saying that experience will remove the former, and the pluck and determination of the mining engineer will always get over the latter.

Employers and Infectious Diseases.

IT is now a matter of common knowledge that the Workmen's Compensation Act makes employers liable to pay compensation in cases where their workmen suffer from certain diseases. But, apart from the diseases which are scheduled to the Act, it is expressly provided that nothing therein contained is to prevent the Court from holding that a workman who becomes infected in the course of his employment is the victim of an accident. We recall a case tried a few years ago, in which the relations of a man who died from anthrax were held to be entitled to compensation. This is a liability which is likely to press heavily upon the woolcombers of Yorkshire. Only last week there was a death at Bradford from this cause. According to the report of an inquest which appeared in the *Manchester Guardian* for July 10th, it appeared that the deceased had for some years been employed by a firm of woolcombers. For the last three years he had never manipulated any wool except in the form of "tops," in which condition it is supposed to be clean and free from dust. A doctor who had made a *post mortem* examination, said that he found a sore on the back of the head about the size of a penny, and that, in his opinion, the cause of death was anthrax, contracted by inoculation in the first instance, and afterwards becoming general. He said that he had never known a case of anthrax arising from English tops. It was proved, however, that the deceased had handled "tops" made of wool imported from various countries. The jury found that anthrax was the cause of death. The liability of an employer in cases of this kind must, however, be limited to claims under the Compensation Act. To an ordinary action for damages sustained in this way, the plea could always be raised that the workman had voluntarily undertaken the risk. In a case which was heard by the Lord Chief Justice last week an attempt was made to recover damages on the ground that the plaintiff had become infected with tuberculosis while engaged in the manufacture of camel's-hair brushes. At the close of the plaintiff's case the jury found for the defendants, apparently on the ground that it had not been proved that the disease was due to the employment. But even if that had been successfully proved, it is difficult to see how the employer could have been held liable at common law.

Passenger Lifts.—On the occasion of the opening of new offices for the National Pension Fund for Nurses in Buckingham Street by the King and Queen last Saturday week, the new automatic electric passenger lift, installed by MESSRS. ARCHIBALD SMITH & STEVENS, was used by their Majesties. This machine is stated to be up-to-date in every respect. No attendant is required. On each floor served is an ordinary button push, momentary pressure of which will call the lift if it is not already in use by another passenger. When the lift cage arrives at the landing the door may be unlocked and opened, and the cage entered. After entering the cage the landing door must be again closed and locked by the simple movement of a lever; if the door is not locked the control circuit is interrupted, and the cage cannot be moved. In the cage are placed a number of button pushes corresponding to the number of floors served. Momentary pressure of any button will send the cage to the corresponding floor, where it stops. A stop button is also provided to stop the cage if a wrong button has been pressed. When the lift is in use all the controlling buttons are dead, so that interference with the passenger using the lift is impossible. No door can be unlocked or opened when the cage is not standing opposite that particular door. The action of locking a door simultaneously restores the electric circuit. We understand that Messrs. Archibald Smith & Stevens have recently erected eight lifts worked on this principle at the new offices of the *Morning Post* in the Strand.

Aluminium Works on the Tyne.—Recently the ALUMINIUM CORPORATION, LTD., established works at Wallsend-on-Tyne, the first furnace being tapped in March this year. Since then the company has been adding to the furnaces, and producing the metal. Now a subsidiary company has been formed called the Bauxite Refining Co., and a site of four acres has been obtained at Hebburn (on the opposite bank of the river to the Wallsend works), and this company will establish its works there. The capital, our correspondent understands, is held by the Aluminium Corporation and the United Alkali Co., Hebburn. Sir James Sivewright, K.C.M.G., is chairman of the Bauxite Co. Preparations are being made to push on with the works at Hebburn as speedily as possible, and it is expected that they will be in full swing by the end of the year; employment will be given to about 150 men. Mr. H. T. Fletcher has been engaged as manager.

Kuzel Lamp in Europe.—The New York *Electrical World* has the following:—"Arrangements have just been completed by which the Pintsch Co. has acquired the European rights to the Dr. Kuzel lamp. A factory will be started in London to manufacture these goods, and it is expected that it will be in operation by August. W. J. Fahn, of Fahn & McJunkin, of New York, representatives of the Kuzel patents, will be general manager of the London factory. The business in this country will remain in the hands of Fahn & McJunkin."

Tramcar Lifeguards.—MESSRS. HUDSON & BOWRING, LTD., have just booked a repeat order for the fitting of the new Salford cars with their lifeguard, and also an order for the Dewsbury and Ossett cars. The firm completed the cars at Greenock and Dumbarton, Singapore, Penang and other systems abroad during the month of June.

Measuring Consumers' Pressure.—MESSRS. ELLIOTT BROS., of Lewisham, are now in a position to supply portable indicating and recording voltmeters for D.C. and A.C. circuits that comply with the requirements of the B. of T. and local authorities for measuring the supply voltage on consumers' premises. Their instruments have been approved for this purpose.

INCORPORATED MUNICIPAL ELECTRICAL ASSOCIATION.

Storage in Electricity Supply.

The attitude of the British central-station engineer towards the adequate storage of electrical energy is, as a rule, a somewhat doubtful and suspicious one; he regards it as a risky, if not foolish, expedient, and in the face of all reason and example, he is apt to consider it a costly luxury. Even when he goes abroad and sees the magnificent installations of accumulators in foreign works, he is by no means convinced or even shaken in his views; but in this respect his indifference is pardonable, for Continental stations are often laid out on a scale of extravagance which puts even our municipal juice-palaces in the shade, and the casual visitor might reasonably suppose that the batteries formed but another outlet for expenditure, less showy but costly enough. It may well be, however, that it is the employment of big batteries that enables the running costs to be kept down in spite of the apparently lavish expenditure on roomy buildings and ornamental features.

The origin of the mental attitude to which we refer is not, we think, difficult to find. It probably arose from the troubles that were experienced in the past with small batteries, ill-used, neglected, and inadequate for their purpose. But the fault was probably rarely to be ascribed to the batteries. More often it was due to the lack of knowledge of the proper care and treatment of storage cells on the part of the station staff, for in a small station it was impossible to afford the luxury of a battery specialist, a rare bird in those days, and the assistants could not be expected to be fully conversant with the peculiarities of a storage battery—a "sensitive plant" indeed. Frequently the battery was looked upon as a last resource in case of emergency, and was called upon heroically to lay down its life in order to keep the lights going until other steps could be taken—after which, it was abandoned and never replaced. Moreover, consulting engineers, who have been responsible for the design of so many generating stations without the necessity of afterwards working them, have hesitated to adopt electrical storage on a large scale, and only in a few cases has a really adequate amount of storage been provided. To follow the fashion is the first law of inexperience, and to fashion must be ascribed the perpetuation of much error in design.

Abroad, however, where works are more generally laid out by those who have to use them, the employment of very large storage batteries has become recognised practice in connection with both A.C. and D.C. stations and sub-stations, and the paper read by Mr. A. M. Taylor on the subject at the recent Convention should do valuable service in calling attention to our backwardness in this respect. Mr. Taylor, of course, is by no means the first to deal with the question; but we hope that he will be more fortunate than his predecessors in gaining the attention of his brother engineers.

That he has expended an immense amount of work upon the preparation of the paper is obvious to all who have seen it; it is accompanied by numerous diagrams and detailed tables which, unfortunately, we cannot reproduce—to do so would require some 20 columns. The author has a gift for constructing curves and diagrams, which, however, are not always so readily intelligible as we could wish, partly because of the small scale to which they are necessarily reduced. In our abstract of the paper we have endeavoured to retain the salient points and the author's conclusions, without the details of the process by which he arrives at them, and, in justice to the author, any criticism of the paper should be based upon direct reference to the original.

That storage batteries nowadays are thoroughly trustworthy, and can be made of any desired capacity, hardly needs emphasis; there is usually, however, some confusion as to the amount of generating plant that can safely be replaced by the battery, in view of the fact that while the latter can only come into action for a few hours, the former is capable of supplying a practically continuous output. Mr. Taylor shows clearly how the battery can be most advantageously employed to deal with the peak load, which never lasts more than a few hours, while the continuous load is handled entirely by the running plant. It should be particularly noticed that his figures are based upon the three-hour rating of the cells, so that the latter can be loaded 100 per cent. beyond this rating in case of need for one hour. But he also goes further, and shows that the battery can be utilised with advantage, not only in the winter, but all the year round, providing an economical load for the generating plant, and allowing a large proportion of the latter to be shut down altogether for a great part of the year.

Curiously enough, he does not greatly elaborate the section from which his paper draws its first title; probably the advantages to be derived from the installation of really large batteries in sub-stations, whether A.C. or D.C., are even greater than when they are put in the main stations, for they enable the feeders—those very expensive items of plant—to be utilised to a far greater extent, and store the energy close to the spot where it is required. Thermal storage presents precisely the opposite kind of storage—at the beginning instead of the end of the route of the energy—so that it does not relieve the engines, generators, feeders, or staff of a fraction of their load. In this connection, it may be remarked that batteries rarely blow up, and batteries installed in properly ventilated rooms never do so. Ingenious methods of using batteries in conjunction with alternating-current generators have been elaborated on the Continent to a remarkable extent, and a variety of boosting systems has been developed there. As for the installation of batteries on consumers' premises, this has been mooted before. It would probably work well in the case of large consumers, but not with small ones. But if it pays the consumer, it will surely pay the undertaker at least as well.

In conclusion, we should like to ask, what is this new system to which Mr. Taylor vaguely refers? He excites our curiosity, but gives no details. We trust that he will continue his campaign; although, as was pointed out in the discussion, the development of the power load and metallic filaments militates against the use of storage, there is still, and long will be, abundant scope for the installation of accumulators with advantage.

"A.C." Accumulator Sub-stations; and the Use of Accumulators for Peak Loads.

By A. M. Taylor (Associate Member), assistant electrical engineer, Birmingham.

(*Abstract of Paper read July 3rd*, 1908.)

A battery will pay for itself if it only lasts as short a period as, say, five years, and therefore there cannot be much risk in installing it (as guarantees for *much* longer periods of maintenance can be had, at reasonable rates, and from responsible parties), but in order to ensure its paying under these conditions, it must be relied on as a real, and not merely a nominal, substitute for generating plant.

Tables I and II give the kilowatts of battery installed for supplying the peak of the load by the Continental Tudor Co. in Berlin, and by the American Chloride Co. in the States.

If cells are installed exclusively to take the peak of the load, and are not discharged unnecessarily, the value of the energy wasted in the cells and accessories is only of the order of 1 to 2 per cent. of the value of the revenue introduced by them. Consequently their inefficiency is not nearly so serious a matter as most people imagine.

TABLE I (*condensed*).

Stations.	No. of cells (approx.).	Aggregate kw. capacity (1 hour).
Berlin Electricity Works (three central stations and 12 sub-stations), total ...	5,280	37,660*
Berlin—Schoneberg (S.W. Electricity Works)	1,200	8,520
Bremen	240	1,244
Hagen i. W.	240	1,340
Halle a. G.	240	2,340
Hamburg (four sub-stations)	840	7,400
Hanover	720	1,780
Munich (three stations)	840	5,120
Copenhagen (three stations)	1,560	8,180
Stockholm (two stations)	360	3,360
Gothenburg	130	2,000
Stuttgart	360	1,600
Grand total	...	80,540

*The generating plant displaced by the cells is of only half the capacity shown.

TABLE II. (*condensed*).

Stations.	Date of installing.	No. of cells.	KW. capacity (1-hour).
Chicago, Edison Co. (9 stations)	1897-1902	1,606	34,840
New York, Edison Co. (16 sub-stations)	1895-1902	3,360	49,000
Edison Illg.Co., Brooklyn (eight sub-stations)	1896-1902	1,280	22,000
Edison Illg. Co., Boston (six sub-stations)	1894-1900	1,280	25,000
Grand total (U.S.A. only) ...	...	...	130,840

The lower half of fig. 1 shows a typical load curve for a station having a present maximum demand of 5,000 KW. All further extensions are assumed to be carried out with batteries till, in 1913, the maximum demand reaches 10,000 KW.

Neglecting changes in the load factor, we may assume that, say, 5,000,000 units are sent out in 1908, and 10,000,000 units in 1913. The battery has thus introduced a revenue of, say, £31,200 per annum (taking 1½d. as an all-round price for light and power and neglecting losses in transmission in each case). What are the losses due to the inefficiency of the battery and adjuncts?

From figures published for the maximum demands at Neptune Bank by Messrs. Merz and McLellan in April, 1904, the lower curve in fig. 2 has been compiled, as a rough approximation to the relative periods of time the station was working during the year on different loads.

From the upper curve of fig. 2, which embraces the extra 5,000,000 units "introduced" by the battery, it will be noticed that the batteries are only called upon to deliver energy when the peak exceeds 5,000 KW. They are, of course, charged when the load is small and the engines and boilers inefficiently loaded.

The author, in the notes accompanying fig. 2, has only considered the employment of the battery in the winter, and for discharging at the heaviest peaks; the extra losses involved in the occasional charges and discharges required during the summer are not serious.

It will be noticed that some 1,100,000 units are put into the battery, of which some 700,000 are reclaimed as "useful" work. In the figures for the increment in fixed charges due to the introduction of the battery, the author debits the "extra" units introduced by the battery with the *whole* of the increment in the fixed charges of the station, as well as with the capital charges on account of the cells: consequently it is unnecessary to debit the 400,000 "wasted" units with anything beyond the coal, water and petty stores consumed. These items are sufficiently covered by the one-fifth penny allowed (see notes on fig. 2). The cost of 400,000 units at one-fifth penny (or £334) is, then, the sum to be set off against the revenue of £31,200, introduced by the cells, on account of the "wasted" units in the battery.

The capital cost of the cells depends very largely on the proportion of the peak which is taken up by them, each successive kilowatt so taken up requiring a longer period of discharge. In a typical case, the first 1,000 KW. taken up require only an average duration of discharge of 1·15 hours, the second 1,000 KW. require three hours, and the third 1,000 KW., 4·26 hours. The average duration of discharge for 3,000 KW. taken up is 2·8 hours, and for 2,000 KW. it is 2·07 hours.

In the comparison which will now be made between the cost of generating plant and batteries, it is assumed that no provision is made for dealing with fog loads, there being numerous towns in the country where such loads are not materially felt. Even where the contrary is the case, the battery can still hold its own, provided that a lesser proportion of the peak is taken up.

In order to obtain a clear idea of the various economies, both in capital cost and running expenses, which may be effected by the introduction of cells to take the peak of the load for light and power work, a typical station has been selected, in which the annual development is assumed to progress at a healthy rate, and the effect is noted of installing accumulators to deal with the peak of the load in place of generating plant, and the annual expenses are estimated in the two cases over a number of years.

The maximum demand increases from 12,000 KW. in 1907-8 to 29,400 KW. in 1912-13, the units sold from 20 to 54 millions, and the plant installed from 16,300 to 32,000 KW.

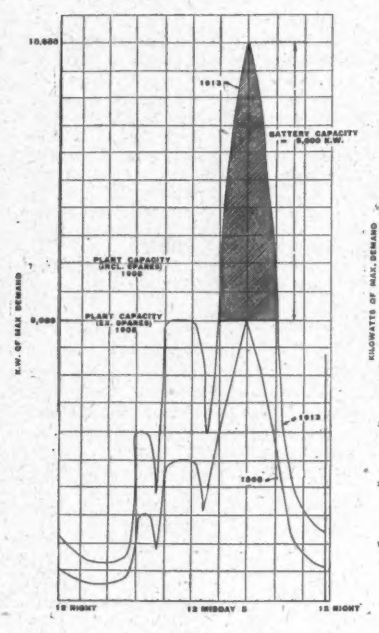


FIG. 1.

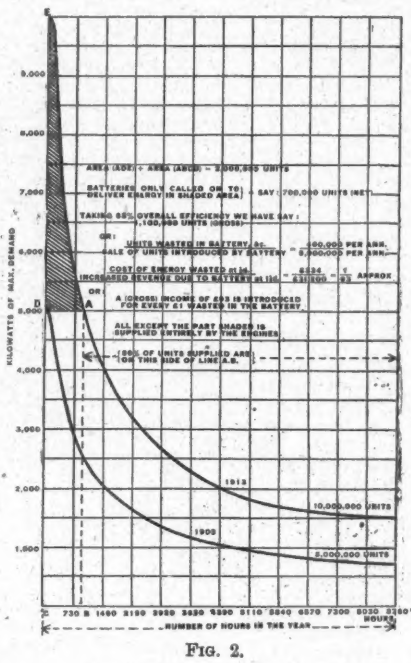

KILOWATTS OF MAX. DEMAND
AREA (ADE) + AREA (ABCD) = 2,000,000 UNITS
BATTERIES ONLY CALLED ON TO DELIVER ENERGY IN SHADED AREA) = SAY 700,000 UNITS (NET)
TAKING 88% OVERALL EFFICIENCY WE HAVE SAY 1,100,000 UNITS (GROSS)
OR:
UNITS WASTED IN BATTERY, &c. = 400,000 PER ANN.
SALE OF UNITS INTRODUCED BY BATTERY = 5,600,000 PER ANN.
COST OF ENERGY WASTED AT 1/5d. = £334
INCREASED REVENUE DUE TO BATTERY AT 1½d. = £31,200 = 93 APPROX
OR:
A (GROSS) INCOME OF £93 IS INTRODUCED FOR EVERY £1 WASTED IN THE BATTERY.
ALL EXCEPT THE PART SHADED IS SUPPLIED ENTIRELY BY THE ENGINES.
(50% OF UNITS SUPPLIED ARE ON THIS SIDE OF LINE A B.
1913
10,000,000 UNITS
1908
5,000,000 UNITS
730 1460 2190 2920 3650 4380 5110 5840 6570 7300 8030 8760
NUMBER OF HOURS IN THE YEAR
HOURS

FIG. 2.

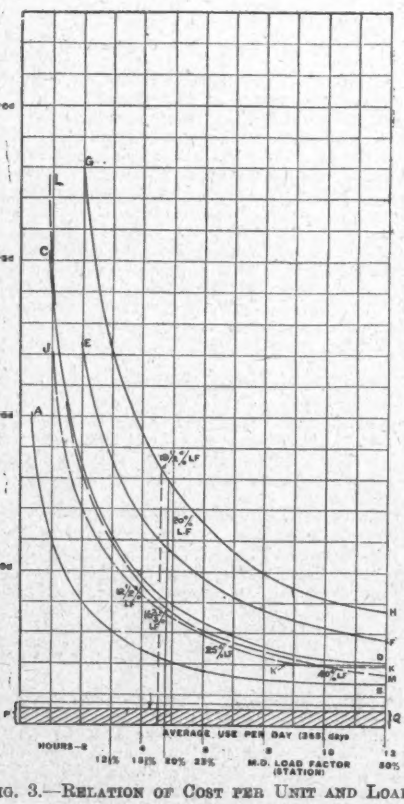


FIG. 3.—RELATION OF COST PER UNIT AND LOAD FACTOR.

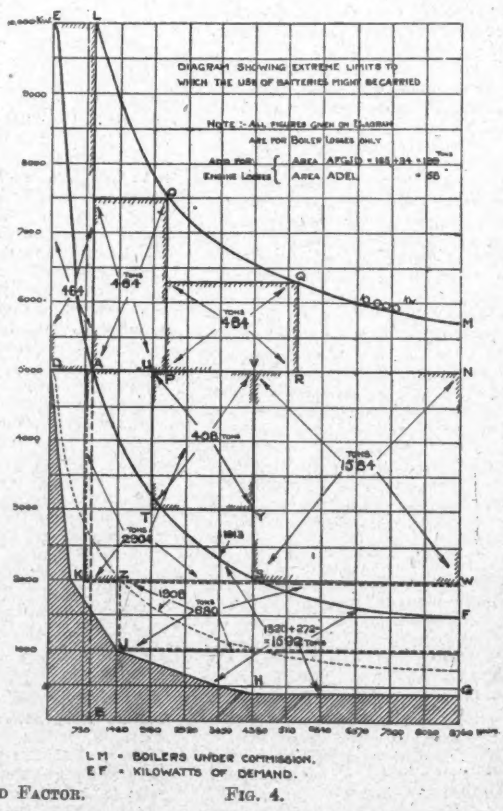


DIAGRAM SHOWING EXTREME LIMITS TO WHICH THE USE OF BATTERIES MIGHT BE CARRIED
NOTE:- ALL FIGURES GIVEN ON DIAGRAM ARE FOR BOILER LOSSES ONLY
AREA APGHD = 165+24+120
AREA ADEL = 56
464 TONS
484 TONS
408 TONS
1584 TONS
2304 TONS
1913
1908
680 TONS
1522+278 = 1800 TONS
LM = BOILERS UNDER COMMISSION.
EF = KILOWATTS OF DEMAND.

FIG. 4.

NOTES TO FIG. 3.—A B, Accumulators; C D, Modern steam plant, additions only (ex. dist.); E F, Existing steam plant (ex. dist.); G H, ditto (inc. dist); L M, Water-power (low head); P, Gross cost, Q, Net cost, of energy supplied to cells. £1 per KW. per annum = at 16·7 % L.F., ·164d. per unit; at 20% L.F., ·137d. per unit; at 25% L.F., ·11d. per unit.

The steam expenses incurred in the year 1907-8 are taken as the basis, and it is assumed that, since no further generating plant is added, the fixed charges and interest and sinking fund charges will remain constant. A consideration, however, of fig. 4, and the remarks made upon this in the Appendix, will show that the author has been very liberal to the steam plant in assuming that the same fixed charges will be incurred at the station. Fig. 4 shows very clearly how it is practicable to considerably *reduce* the average number of boilers under commission.

To the total of the steam plant charges incurred in the year 1907-8 is added a sum representing 12 per cent. on the cost of the cells added during the year 1908, and the total so obtained is plotted as the cost for the year ending in March, 1909. The capital cost of the cells and their accessories, inclusive of building, has been put in at £15 per kilowatt throughout. In the years 1910 to 1911, 1911 to 1912, and 1912 to 1913, a small sum (£1,000) has been added to cover the cost of extra wages for attending to the cells and apparatus.

Interest charges on the cells are taken at 3 per cent., and depreciation and maintenance charges at 9 per cent.*

The savings introduced by the cells, as against steam plant, are £12,000, £24,000, £37,000, £46,000, and £64,000, respectively, in the five years following 1907-8; a *total saving of* £183,000.

The author has taken the increments which each year shows over 1907-8 in annual expense, and has divided these by the corresponding increments in units sold, with the result that for the steam plant the costs of each extra unit sold are 1·09d., 0·9d., 0·91d., 0·86d., and 0·85d., whereas with the combined steam and accumulator plant, the corresponding costs are 0·62d., 0·44d., 0·40d., 0·42d., and 0·39d., with the result as already stated that the total net saving in five years is £183,000 *after* providing for the payment of interest, depreciation and maintenance on the accumulators, representing *an average saving of* £36,600 *per annum*.

It may be pointed out that the £64,000 saving in 1912-13 would pay an additional 10½ per cent. interest on the total investment in cells and accessories, including that of 1912-13.

As a further illustration of the relative costs of the cells and of the steam plant, the author has resolved the cost into curves, connecting load factor and price per unit, which are shown on fig. 3. In this figure the cost for the battery itself and the increment in fixed charges introduced by it is shown by the curve A B, the corresponding curve for the increment in the generating plant (excluding distribution) being marked C D on the above figure. It is to be noted that in these two curves (fig. 3), we have a comparison between the cost of introducing to an already large generating station the necessary steam plant, of the most modern reciprocating type and in large units, in order to deal with a stated increment in the maximum demand of the station; and on the other hand, the corresponding costs for accumulator plant capable of dealing with the *same* increment in the maximum demand. We are not, therefore, comparing merely the total capital and other costs per kilowatt, incurred to date (which figure would be handicapped by the amount of capital that had been spent in past years on obsolete or inefficient plant), but are considering the relative merits of the two systems under absolutely identical conditions. To show the difference that would be obtained in favour of the electric accumulator system, were we to compare its added costs with the *existing* costs of the steam system (as we might do if the station had reached its limit of extension), we have only to compare curve A B with curve E F (the latter representing the costs for 1907-8, for any load factor). The author submits that in estimating the saving introduced by putting down accumulators, it is not in certain cases unfair to take the difference in costs between the curves E F and A B as representing the saving, since the station is at the present time charging the consumer on the basis of the curve E F, while the added cost for each unit sold with the accumulators is only that represented by the curve A B. Each extra unit sold (due to the growth of the load) would, therefore, bring in, *if present* prices remained unaltered, a net profit represented by the difference between these two curves; or say, 0·85d. per unit on a 16 per cent. load factor.

The cost of the energy used in charging the cells is so very low that the inefficiency of the cells and accessories is much more than compensated by the gain in coal economy on the "interest-paying" units. The result of calculations which the author has made in conjunction with the employment of sub-stations has satisfied him that there is a future for such a scheme (particularly in connection with long-distance transmission of power), the batteries being put down here rather than at the generating station.

Where cells of very large individual capacity can be installed, it is possible to obtain a discharge representing 6 KW. (on a three-hour basis) for every square yard of floor space for a single tier of batteries; the extra floor space required for the rotary converters, &c., is not at all serious. A separate building could be erected for the cells on a single floor only for something under 7s. 6d. per KW., and even were the cells arranged on two or three floors the cost need not exceed, say, 15s. to £1 per KW.; land in the vicinity of sub-stations could generally be obtained at the rate of about 12s. per sq. yd., which, for a single-storey battery, works out at 2s. per KW. In the smaller sizes of sub-stations, up to 2,000 KW., the author believes that his low-voltage system of accumulators will be found very useful in reducing floor space, as well as capital cost.

By this means it is possible to use the batteries to deliver alternating current of high pressure into the line at times of peak load, while at the same time delivering direct current of suitable pressure to the bus-bars of the sub-station, and the author believes that this and other combinations will be found to be valuable as a means of relieving the main generating station at the time of peak load, as well as the feeders. The efficiency to be obtained on discharge, as between battery terminals and A.C. bus-bars, will in a large sub-station be found of the order of 93 per cent., and that between the battery and the sub-station D.C. bus-bars of the order of 87 per cent., and even in a small sub-station these figures would not be materially less than 90 per cent. and 82 per cent. respectively. Such a system may be found very helpful on long high-pressure lines, such as those on the outskirts of a power company, the accumulators in this case enabling a given amount of maximum demand to be met at a sub-centre for a very much less expenditure in E.H.T. cables than would otherwise be incurred; or it would be possible to supply a given maximum demand at much greater distances from the main generating station with economy than has hitherto been the case.

The introduction of accumulators into the smaller stations, worked on the lines of fig. 4, would introduce great economies, and in many cases would enable the existing small units to be replaced by large and more economical units.

The author suggests that fig. 3 will be found helpful as showing at a glance and in a single diagram, the net effect of using cells on the cost per (extra) unit for different (station) load factors. It also shows in a clear way the *pronounced* saving introduced by using cells, as against modern steam plant; and that, too, of the largest sizes likely to be available in the majority of cases.

The figure of £15 per KW. of maximum demand for the batteries includes building and land, but no spare battery capacity, there being 100 per cent. overload capacity in the battery for one hour, and the chance of interruption with a properly-designed battery plant being so much more remote than with running machinery or even steam boilers and accessories.

APPENDIX.—THE BATTERY AS A COAL SAVER.

In fig. 2 we have the battery providing only some 700,000 units out of a total of 10,000,000; or 7 per cent. of the total. In fig. 4 we have precisely the same battery used to provide some 7,500,000 units, or, say, 75 per cent. of the total. The station is also equipped with the same steam plant in the two cases.

Consider first the peak-load battery. While the coal consumption on the *whole* output of the engine is reduced by adding the battery load, in the ratio of 2·5 lb. to 1·96 lb. (a reduction of 22 per cent.) the efficiency of the electrical system is decreased by 18 per cent., leaving 4 per cent. in favour of the change, so that, considering only the application of the battery to the winter peaks, it can hardly claim to be much of a coal saver.

If, however, the battery is used on the lines indicated in fig. 4, the case is very different. It will be clear from this figure that 60 per cent. of *the running plant* (or 3,000 KW.) could be entirely shut down over 11 months of the year and a further 20 per cent. over 10 months; whereas, in fig. 2 the same 60 per cent. could only be shut down for six months and the 20 per cent. for, say, the equivalent of six months (more correctly, 40 per cent. for three months).

The last 20 per cent. in fig. 4 will have to run longer hours daily, in order to generate the energy shown in the unshaded part of the figure; but the set will, throughout, be running under conditions of maximum economy, and the total amount of coal saved in the year would be quite considerable. The author estimates it at some 1,791 tons, representing an annual saving of, say, £680. The above saving is quite distinct from the corresponding saving on those steam sets which are *entirely* displaced by the battery. Figs. 2 and 4 both contemplate 5,000 KW. of plant so displaced. On this account a total of some 1,450 tons has to be added to the 1,791 tons already estimated; or 3,241 tons in all.

The saving on the *running* units, due to better loading-up by means of the battery, has again to be added to the above. It may be taken as being, in the most favourable case, 22 per cent. of, say, 13,400 tons, or 2,940 tons. The total saving would thus be some 6,180 tons.

Against this must be set off some 4,000,000 "waste" units at 1·91 lb. per unit or 3,420 tons.

A net saving of some 2,760 tons would thus appear to be what, under favourable circumstances, the battery might effect; but it will be noticed that in fig. 3 the author contents himself with merely assuming that the gains balance the losses—an assumption distinctly favouring steam.

The author believes that it will be found in the future that large manufacturers, employing either A.C. or D.C. motors, will find it to their interest to put down accumulators on their premises; and where their works are large these installations will take the nature of sub-stations. By means of the low-voltage system of supply which he has worked out, the author anticipates to be able to introduce accumulators of large capacity successfully on consumers' premises.

Introducing the paper, in abstract, the AUTHOR remarked that battery after battery of exceedingly large capacity was put down during a period of some seven years for peak-load purposes in Chicago, New York, Brooklyn, Boston, &c.; the inference should be safe that, for seven years at least, the cells gave entire satisfaction, and his figures for maintenance, being based on the renewal of the plates at the end of a seven-year period, should, therefore, be substantially correct. Under the author's system of independent units, it was possible in the earlier stages of the equipment to

* The question as to whether a sinking fund need be allowed for at all in the case of cells, which may require replating every six or seven years, is, in the author's opinion, rather a moot one. In any case, *another 3 per cent. on the cells will not make a very material difference* on the savings indicated. The cells themselves only cost some 70 per cent. of the sum on which the above 9 per cent. is paid. Some 10½ per cent. on the cells is thus really covered.

provide 100 per cent. spare battery capacity consisting of practically unused cells, and 25 per cent. (or, counting overload capacity, 50 per cent.) in the later stages, for an additional annual charge of £0·4 per KW. of M.D. corresponding to ·055d. per unit at 20 per cent. load-factor; and it was perfectly practicable to switch out the faulty group of cells and switch in the spare group at any time, and at a moment's notice. There was an estimated saving of £64,000 in the year 1912-13, but the increment of £5,300 allowed for fixed charges was insufficient, and had been corrected to £13,150, reducing the saving by £7,850, to some £55,000 per annum.

The £7,850 (= £0·45 per extra KW. of M.D. *added*) required to be added to the accumulator costs for 1912-13.

In fig. 3 the results were expressed in terms of the load-factor. Curve A B showed costs per extra unit for cells; curve C D those for *steam*. Curve A B should be corrected by ·060d. per unit at 20 per cent. L.F. on account of the £7,850 alluded to above. If the cost of steam plant were taken as low as £20 per KW. of maximum demand, curve C D was only reduced by ·04.

In connection with the employment of cells in sub-stations, the author's arrangements would double or treble the capacity that could be stored on a given area of floor space, and at the same time would permit of a capital outlay which was much less than with existing schemes, and would provide means for extending from the smallest sizes of sub-station up to any size desired without waste of floor space or scrapping of plant.

A saving of some 4,750 tons of coal per annum was shown as the most favourable case for a station having an output of 10,000 KW. of M.D., and this would be probably not less than 3,000 tons even where the engines were already well loaded up. This figure would correspond with 9,000 tons in a station of the magnitude considered in fig. 3. The curves and data applied to both A.C. and D.C. sub-stations.

DISCUSSION.

The discussion was opened by MR. T. P. WILMSHURST, who noted that only two pages of the paper directly referred to the subject of its title, the remainder dealing with the question of taking up the peak load during the next five years. The author's proposal was a bold one, and it invited much criticism; as far as the A.C. battery sub-station was concerned, he thought the additional cost of the converting plant would wipe out any prospective saving in other directions in purely alternating supply areas. With steam plant they could take an indefinite overload as regards time, but the battery was only good for an hour or two. Large towns had to deal with very heavy fog loads, and he thought the author had not given this matter sufficient consideration in his argument; he further, could not agree to the author's typical load curve, as the peak curve at his own station (Derby) was more than 50 per cent. wider, and this would double the battery power on the peak load. The author appeared to base his arguments on one load factor during the five years, but this would not be the case, and the financial aspect would alter accordingly. He also doubted whether the ampere-hour efficiency of the batteries would not suffer through the heavy discharges, and asked whether the American batteries referred to were used in this way. Batteries were very useful for taking light loads, as auxiliaries, and in his own town they took the early morning car service and some of the street lighting.

MR. L. BROCKMAN agreed with the author that there was greater immunity from breakdown with battery plant than with rotary plant. He considered that the "unit" construction was a great point in favour of batteries, and advocated the use of automatic stills for obtaining suitable water.

MR. H. RICHARDSON said he thought that before the author's scheme came into being it would be a case of large power stations doing a little lighting, rather than *vice versâ*. The peak load was already improving through the combined effect of efficient lamps and improving motor loads. He could not agree as to the life of the battery suggested by the author, under his conditions of working. Load factors were improving all round, and he could not see how the problem set by the author could be approached commercially.

MR. J. E. EDGCOME doubted whether the author's scheme was applicable to such an area as the City of London, where fog loads frequently lasted all day.

MR. E. S. NEW said there was no material difference in efficiency in a battery discharging on the 1-hour or the 10-hour rate. He considered that the battery maker would be only too glad to get the 9 per cent. for maintenance; he only got 6 per cent. now. The important point to consider, though, was the financial standing of the battery makers.

MR. E. S. JACOB pointed out that the peak load was regularly taken by batteries in a number of stations in this country and abroad. The largest battery, of 6,000 to 7,000 KW., was installed in a London station. It represented some 25 per cent. of the plant installed.

MR. F. C. RAPHAEL asked for information as to the watt-hour efficiency of batteries on varying discharges; he also doubted whether the battery makers would be prepared to give a 9 per cent. maintenance contract, if the batteries were to be subject to emergency discharges.

MR. S. J. WATSON thought it mattered little that a battery was only capable of taking the load for two or three hours at a time, as it was not necessary that it should do more. The whole question turned on load factor. With a large load factor, the battery would be of little use, but with a 10-15 per cent. load factor, it might be exceedingly useful, and this applied particularly to cases where a bulk supply was taken from a company for distribution, the price depending on load factor. Taking the one-hour rate, the cost of the battery and buildings in his own undertaking came out at £8 per KW.; at a 7-hour rate, the figure became £20, so the question turned largely on the discharge rate.

MR. P. J. TIDDEMAN thought the battery would be more costly than shown, as in practice a large margin of spare capacity was required.

MR. C. TURNBULL said there was a good deal in the battery, which had suffered in the past through lack of knowledge as to its usage. He felt that the battery would eventually be used for all jerky loads, such as might occur with railway operation.

MR. F. A. NEWINGTON thought the really useful figures as to works costs of the American battery stations had been omitted by the author.

MR. A. M. TAYLOR points out in a written reply, that after analysing many peak tops, including those of stations having a tramway load like Manchester, Birmingham, &c., he invariably finds that a 3-hour battery rating would take up some 33 per cent. of the peak. This applies to stations having load factors of 20 per cent. and over, and shows that the load factor, except as regards the saving of coal, is of much less importance than Mr. Wilmshurst implies, owing to the fact that one gets 100 per cent. more KW.-hours out of a battery on a 3-hour rating than on a 1-hour, and so on for longer discharges. As regards fixed charges, the battery scheme can face a large increase in the annual load factor with equanimity. Power loads themselves vary from day to day and hour to hour, and some stations have tramway loads as well, and are expecting big lighting loads. The first Chicago battery was absolutely a substitute for generating plant, for which there was no accommodation. As regards the working expenses, these were recently given by Mr. Parshall at 0·25d. per unit for Chicago. The KW. capacities alluded to in the paper are based on a *three-hour* rating; hence the 15,000-KW. battery *could* do 30,000 KW. for one hour (the 100 per cent. overload capacity alluded to), which, however, since there are 19,000 KW. of steam plant, and the peak load only 30,000 KW., it would never be called on to do, unless the steam plant totally failed. Fogs excepted, the estimates given in the paper will hold for towns having large power and tramway loads such as Manchester, Liverpool, Birmingham, &c., provided that only some 30 per cent. of the peak is taken up by the cells. In such towns the fog load rarely exceeds 66 per cent. of the peak load on account of the less amount of lighting; consequently the steam plant is capable of meeting it with very little assistance from the batteries; one figure shows a fog load of nearly 10 hours' duration—probably rarely exceeded even in London—and the estimates of the saving (per kilowatt) given, would still apply, provided that the battery was only put in to deal with, say, 25 per cent. of the peak. If the batteries are put in for 50 per cent. of the peak, a fog load *averaging* 75 per cent. of the mid-winter peak, over 7-8 hours, can be dealt with by the combined plant, without *any* extra expenditure on battery power.

THE COLLIERY EXHIBITION.

THE fourth exhibition of colliery machinery instituted by Mr. W. Greville Montgomery, M.P., was formally opened by Lord Strathcona on Saturday last at Olympia, and will remain open until the end of this month.

In opening the Exhibition, Lord Strathcona remarked on the mining industry of Canada, which contains vast mineral wealth, and said that whereas the produce of the mines 20 years ago was worth ten million dollars, to-day they were producing nearly ninety million dollars worth; he emphasised the opportunity given by the Exhibition to mining engineers of inspecting the latest improvements in the various appliances used in mining. Lord Airedale, in proposing a vote of thanks to Lord Strathcona, also referred to machinery exhibits, and expressed a hope that the more extended use of mechanical appliances would remove any difficulties that might be encountered through the passing of the Eight Hours in Mines Bill. A large number of guests were afterwards entertained to luncheon.

With regard to the exhibits, these consist of excellent examples of the most up-to-date machinery for rock drilling, coal-cutting, hauling, screening and sorting coal, air-compressing, pumping, ventilating, water softening, &c., very many of which are designed to be operated by electricity. The rock drills are all operated by compressed air, as for the most part, when dealing with hard rock, a percussive action is required, and it is interesting to note the reduction in the size and weight of these machines compared to what they were a few years ago, due to the adoption of the "hammer" action.

For softer material, such as coal fire-clay, &c., a rotary drill may be used, and for this purpose MESSRS. JOHN DAVIS & SON (DERBY), LTD., exhibit a new Jeffrey electric drill, which

they claim will bore ironstone, phosphates, oil-shale, &c., specimens of these being shown on the stand, and it is claimed that the electrical and mechanical portions will withstand any duty they are called upon to perform. The drill mounted upon the stand is shown in fig. 1, and as will be seen, the drill frame is of the usual pattern, and is jacked between the floor and roof of a mine, or between timbers in the ordinary manner. The drill may be fixed at any convenient height and at any desired angle.

The design embraces several features of novelty. The armature has a hollow spindle, through which the drill feed-screw passes. By this means a well-balanced drill is provided; hitherto the motor has necessarily been above, below, or on one side of the feed-screw. The gearing is also remodelled in this drill. A pinion surrounds the hollow armature shaft, and this engages above and below with two driven wheels, both of the same size. Mounted on the same shafts with the gears are the pinions of the second-reduction set of gearing. These pinions engage the gear

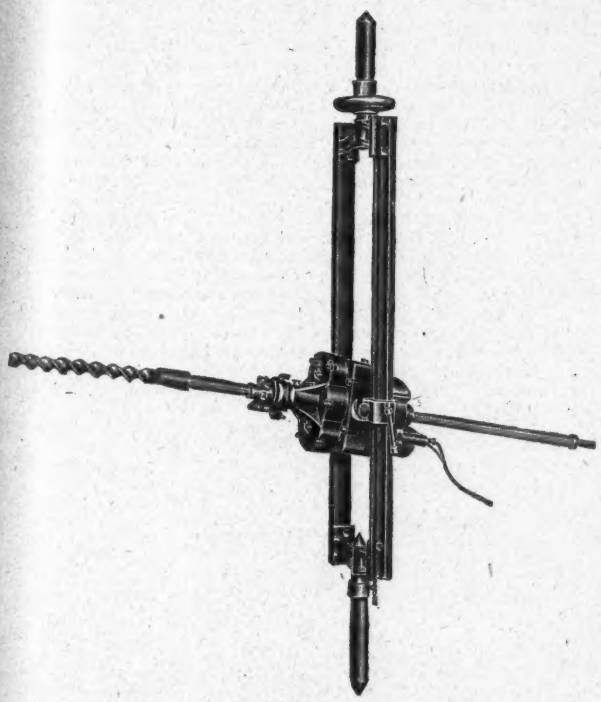


Fig. 1.—Jeffrey Electric Drill.

which drives the feed-screw. The gear wheels are accessible, and one of the features obtained in the design is the ease by which the gears may be varied.

It will be seen by the figures given below that the revolutions per minute of the auger may be varied from 106 to 310, and the forward feed or rate of cutting may be varied from 10·6 in. per minute up to 62 in. per minute, out of a variety of 16 combinations. It will thus be possible to select the most suitable gearing, not only for rate of cutting but also for speed of rotation, to suit almost any degree of hardness of the material it is desired to drill.

Descriptive letter ...	A	B	C	D
Rev. of feed screw per minute ...	106	167	224	310
Threads per inch of the feed screw.	Forward feed per minute.			
E 5 Acme threads ...	21·2 in.	33·5 in.	44·75 in.	62·0 in.
F 6 „ „ ...	17·9 in.	27·8 in.	37·4 in.	51·6 in.
G 8 „ „ ...	13·25 in.	20·9 in.	28·0 in.	38·8 in.
H 10 „ „ ...	10·6 in.	16·7 in.	22·4 in.	31·0 in.

A friction band is provided, with a winged nut and bolt for adjusting the pressure, to allow the feed bar to revolve with the auger without progressing should it encounter any foreign substance in drilling, and so avoid unnecessary strains.

The motor starting switch and gearing are contained in a case which is both water and gas tight. The terminal pins are so arranged that when the cable sockets are withdrawn the arc is broken in an enclosure. Thus the drill may be used in pits where Rule 8 of the Electricity in Mines Act applies.

The firm also show the well-known Jeffrey "heading" machine, which has been reconstructed to conform with the Home Office rules. The motor is totally enclosed, as also is

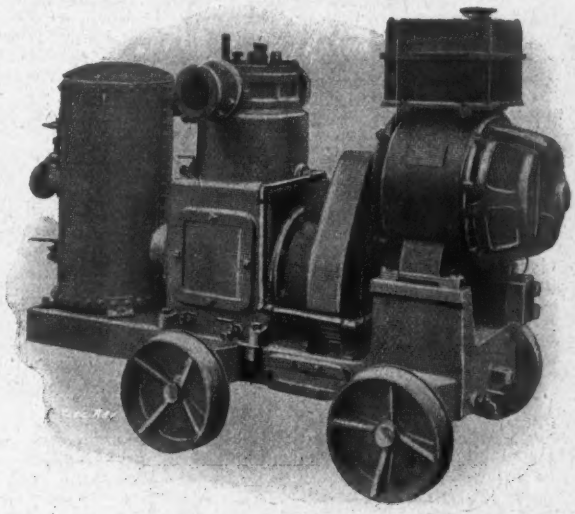


Fig. 2.—Brotherhood Air-Compressor.

the starting switch. The electrical connections are also "fool-proof," so that it is impossible for a spark to ignite gas when withdrawing the connecting plugs.

The Diamond Coal-Cutter Co., of Stennard Works, Wakefield, exhibit a number of their well-known Diamond Longwall machines, both of the disk and chain types. The disk pattern is represented by two coal cutters, one a Diamond Standard compressed-air machine fitted with double-acting tandem cylinders, the overall height being less than 18 in. The other is a two-motor standard Diamond electric disk machine of the latest pattern. The motors (direct current) are wound for 500 volts, and each is capable of developing continuously 18 B.H.P. All the cables on this machine are entirely enclosed, but, at the same time, are easily accessible. A tramway type controller is used, with magnetic blow-out and a separate fuse chamber. The switch lid, the fuse chamber lid and the cable plug are automatically locked when the current is switched on, and cannot be opened or removed till the current is off.

The 1908 type electrically-driven Diamond chain cutter is fitted with a 24-B.H.P. (direct or alternating current) motor, and it is claimed that the reduction gears are of a simpler form and more efficient than in any other machine of this type. The gears are of steel throughout, are enclosed and run in oil. The chain jib parts are interchangeable with those of the compressed-air machine, and the overall height of the cutter is 19 in. and the length only 7 ft. 6 in. This cutter is particularly suitable for short faces where a comparatively light and small machine is necessary, and one that will cut its own way under the coal. A two-motor Diamond longwall chain machine is also exhibited, this being of the overcut type to remove a parting at any height, from 20 in. upwards, from the floor. The *débris* removed is carried by the cutters over plates provided for the purpose and deposited direct into the gob.

The firm also exhibit a section of their latest type improved Blackett underground conveyor. The discharging-end shown is fitted with a specially designed electric motor which fits under the trough. Hitherto no electric motor of sufficient power has been devised to go into this space, but the Diamond Co. have now succeeded in overcoming this difficulty. A further improvement is the recently patented epicyclic gears, which are entirely enclosed, run in oil, and occupy a very small space. In this little gear box 10 H.P. is transmitted, and the speed reduced in the ratio of 16 to 1. The Diamond Co.'s stand also con-

tains examples of their latest pattern underground electric switches and other equipment, and the usual accessories connected with machine mining.

MESSRS. PETER BROTHERHOOD, LTD., exhibit several examples of their vertical electric-driven air compressors, one such for mining work mounted upon wheels, being shown in fig. 2. The electro-motor drives the compressor through gearing, which, together with the air receiver, is mounted upon a box bedplate, which forms a reservoir for the circulating cooling water. Another machine exhibited on this stand is designed for use in central stations for the purpose of blowing dust out of armatures. For this operation a length of tube fitted with a nozzle is provided. One feature of these compressors is the small spring-loaded cup-shaped valve, which is pressed out of sheet-steel, and works on a plain flat face of cast-iron.

(*To be continued.*)

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

Working Speed in Telegraphy.

The only reason I did not quote the rest of Mr. Raymond-Barker's sentence, to which he alludes, is because it appeared to be mainly based on a report in another journal. I have since, however, learnt that the information Mr. Raymond-Barker quoted is, at any rate, authenticated by others.

In anything that I said originally, I merely intended to convey that I did not consider the duplex-automatic system applicable in practice to wireless telegraphy in the same way that it was to cables. And I think so still, for it must be remembered that Mr. Raymond-Barker is speaking of a particular system of wireless telegraphy—not that which was being dealt with by the *Morning Post*. As I spoke originally of the duplex-automatic system in connection with cables, I continued to do so in connection with radio-telegraphy, though quite appreciating Mr. Raymond-Barker's point that there is no difficulty about radio-automatic working.

Mr. Raymond-Barker and myself have now reached much about the same position—*i.e.*, that "cable-working with its present very high standard of efficiency daily developing fresh possibilities . . . fresh actualities in speed attributes, remains paramount and practically untouched."

The only difference between us is that he considers the recent statements in the lay Press in regard to wireless telegraphy supplanting cable telegraphy have had a serious influence on cable shares, and I was inclined to differ from this view; but this is, of course, purely a matter of opinion, in which Mr. Raymond-Barker is—as I have already said—quite likely to be right and I wrong.

Charles Bright.

Westminster, *July* 14*th*.

Tramway Discipline.

It is not a weakness of mine to rush into print, in fact, I think it is the first time that I have transgressed, but your leading article in this week's issue on "The Merit and Demerit System of Discipline" attaches to the tramway managers of this country so much cruelty and immorality with regard to their dealings with their employés, that I think it only fair that your wholesale denunciation should have some reply.

It has for some time past been apparent to many of us that the system of suspension was a form of punishment which did not adequately meet the case, as we all know that the sufferers under this system are not the men, who will not have one ounce less tobacco, or in the majority of cases suffer any personal inconvenience, but their wives and children, who feel the pinch, and in order to give the managers some more flexible and satisfactory method of dealing with minor offences, various systems of bonuses have been devised which appeal more to the self-esteem of the men than perhaps the actual monetary value attaching to them.

In our own case it consists of a bonus which is given in the form of a Christmas box at the end of the year, and which is liable to deductions at the entire discretion of the manager, the employé who gets his bonus untouched also receives a good conduct stripe. This system has been in operation now for over two years, and I have found it most efficient and satisfactory.

I should like to add that in every case when the deduction is made upon an inspector's report, the employé is notified of the same, and has the right of appeal to the manager if he considers it unfair, or if he has any explanation to offer.

On behalf of myself and other managers who I know adopt this or a similar system.

E. S. Rayner.

Electricity Works, Doncaster.
July 10*th*, 1908.

P.S.—We always knew that our editor was a soft-hearted man.

[We trust that our remarks have not been construed to imply *intentional* cruelty on the part of the managers. As regards their general accuracy, it will be seen that Mr. Rayner agrees with us on the whole.—EDS. E.R.]

Electricity in Collieries.

With reference to your article in a recent number of your paper regarding the recent explosion in the Mary Pit, Fife, you made certain remarks as to the necessity of having capable electrical engineers in large collieries.

It has been my pleasure to have been acquainted with the present chief electrical engineer in the above pit, and I know from his past experience and the responsible positions he has previously held with credit, that the plant in the Mary Pit would be kept in the best possible condition.

An enclosed motor and starter was in readiness to replace the open type motor which was supposed to have caused the explosion, but, unfortunately, circumstances prevented it being in time to prevent this explosion.

I only write this to clear from the minds of your readers the impression that this unfortunate explosion was in any way caused by an incapable engineer.

H. D. B.

[We hardly need point out that the article in question contains no reflection upon the electrical engineer at the Mary Pit, but we would ask why the enclosed motor and starter were not installed *at first*, as they ought to have been? "H. D. B.," however, seems to miss our point, which was that the electrical engineer should be responsible to the "law," and not the manager.—EDS. E.R.]

Telephone Licences.

Referring to the letter in your issue of the 3rd inst. from Mr. J. L. Newland, that gentleman's statement that it has always been the opinion of the National Telephone Co. that "A to B" lines were outside the monopoly of the Postmaster-General, is quite correct, but I fear the same adjective cannot be applied to his statement that it has suited the company's purpose until now to pay Royalty on such lines, in order to prevent the point being fought out in the Courts, which would have permitted his and other electrical firms to have erected such lines. In view of the fact that the company has been fighting the department on the point for years, with the result that it was finally referred to a Court of First Instance, when Mr. Justice Swinfen Eady gave a decision against the company—which decision has been, as you know, recently reversed by the Court of Appeal—I think that further comment is unnecessary.

The National Telephone Co., Ltd.
S. J. GODDARD.

London, E.C., *July* 7*th*, 1908.

Conditions of Employment.

I have been interested in reading your article on agreements. Perhaps the following facts would be of interest to your readers.

Personally I have had a little to do with signing down, but have always managed to turn the benefits on my own side. I would never lose a berth because of signing, but

then would do as I chose, as I have been legally advised, unless everything in the agreement is equal on both sides, the agreement is void.

An old schoolmate of mine was holding a berth with a large cycle dealer. A new manager appeared on the scene, and the first thing he did was to tie everyone in the offices with signed agreements. I know of several who have left their berths rather than sign. As far as I can remember, the terms were as follows :—

No other berth within a radius of 50 miles of offices in any cycle dealers', manufacturers', &c., employ whatsoever for two years; they to dismiss at a week's notice, if wished to.

Now this looks rather formidable, especially as, at that time, the only berths worth having were in cycle departments offices.

My old mate signed on, and stuck his job for a few months. Another firm offered him a better berth, and he accepted it, handing in a week's notice. He was informed that legal proceedings would be taken if he left, but he was not to be frightened, and took up his new berth. The firm applied for an injunction against him in the local County Court, but the Judge found for the man, not for the firm, stating that agreements of this kind were a farce and not worth the paper upon which they were written. He also stated that, for an agreement to be of any good, it must be about equal to all parties concerned.

Now, if a few cases like this could be brought to the notice of the public, possibly firms would get tired of sealed agreements.

Fairplay.

Rail Corrugation.

The theory put forward by Mr. J. F. Jones in your issue of June 5th is one that has also suggested itself to me—in fact, you were good enough to publish a letter of mine on the subject about two years ago, when I pointed out the resemblance between a spoked wheel and a "milling" or "knurling" tool, and advocated the trial of spokeless driving wheels. I do not think, however, that spoked wheels can possibly be the sole cause of the trouble, because such wheels have always been used on steam-worked railways and tramways, and have never been known to produce such effects as are now being experienced on electric tramways.

I am aware that the railway systems of India have been an exception to this immunity, and this circumstance seems to point to the existence of some important factor, either in the construction or the working of the railways of that country, which is common to a large number of electric tramway systems. It would be exceedingly instructive if this factor could be isolated.

D. E.

Are Consulting Engineers Necessary?

I have been much interested in the correspondence which has recently been appearing in your columns on this subject.

I most heartily endorse the letter signed "Verbum Sap.," which appeared in your issue of June 26th, and consider that the writer states the case for the genuine consultants extremely well.

It is very right and proper that our Institution should issue their rules of etiquette for the guidance of consultants, but their work is only half done if they do not also make some effort to see that they do not suffer from unfair competition.

As pointed out by "Verbum Sap.," architects trespass freely in what is the consultant's legitimate work, and I commend the suggestion that the I.E.E. should take the matter up with the Royal Institute of British Architects.

The following extract from a letter which I received only a few days ago from some clients, will, I think, be found to express the opinion of many with regard to the employment of architects in connection with electric light installations :—

"We all feel very much obliged to you for help in this matter, which must otherwise have been left to the architect, who, in the nature of the case, can hardly be an expert, and who would have to rely on his contracting firm. We are convinced that a better result will be achieved by your help."

A wiring contractor recently told me that he is always required by one of his architect-consultant clients to draw up his specifications for him. These specifications are then formally issued to the contractor to work to. However, given an honest contractor, perhaps this is preferable to the architect drawing up specifications for himself.

I believe that there exists at the present time a desire in the electrical profession for the services of genuine and capable consultants, and any steps which can be taken to aid the development of such a body will be to the advantage of the profession as a whole.

One who is Interested.

PARLIAMENTARY.

Telegraph Construction Bill.

This Bill was before Standing Committee C on Thursday, July 9th. The Bill amends the Telegraph Acts, 1863 to 1907, with respect to the construction and maintenance of telegraphic lines for telephonic and other telegraphic purposes. Clause 1 sets out that if the owner or occupier of any hedge or bank forming the boundary of a public road along which the Postmaster-General desires to construct a telegraphic line fails to give consent within one month a difference shall be deemed to have arisen between the parties, and in that case Secs. 3, 4, and 5 of the Telegraph Act of 1878 shall apply. Clause 3 provides that the provisions of Sec. 2 of the Telegraph Act of 1892 shall apply where, on the application of the Postmaster-General, the Railway and Canal Commission are satisfied that owing to the refusal or failure of any person or being the owner or occupier of any land or building, to consent to the construction or maintenance of a work by the Postmaster-General, telegraphic communication cannot be supplied to any district or place, except at unreasonable cost or on unreasonable conditions. Clause 4 provides for the lopping of trees which obstruct a telegraphic line and give the Postmaster-General power to issue instructions to his officers with a view to "ensuring that trees shall be lopped in a husbandlike manner and so as to avoid injury to their growth."

At the instance of the Postmaster-General the Committee inserted the following new clause after Clause 4 :—

"Notwithstanding anything in the Railway and Canal Traffic Act, 1888, any difference directed to be determined by the Railway and Canal Commission under the Telegraph Acts, 1863 to 1907, or this Act, may in the discretion of the Commission be heard and determined by the two appointed Commissioners, whose order shall be deemed to be the order of the Commission."

"The provisions of Sub-Sec. 2 of Sec. 4 of the Telegraph Act, 1892, shall be deemed to extend to telegraphs placed and maintained under a street or public road."

Viscount Morpeth moved the addition of the following clause, which was carried:—"Notwithstanding the provisions of this Act no telegraphic line shall be constructed on, over, along, or across any land dedicated to the recreation of the public, or any hedge or bank adjoining such land, without the consent of the person in whom such land is vested or under whose control or management such land for the time being remains."

The Bill as amended was ordered to be reported to the House.

London County Council Tramways Bill.

Mr. Emmott's Select Committee of the House of Commons has passed the preamble of this Bill. In a report to the House the Committee stated that they had a report from the Board of Agriculture and Fisheries in which it was stated that under the Bill the L.C.C. sought power to utilise a strip, about 7 ft. wide, of Streatham Green, which appeared to be an open space under the management of the County Council. The board said they did not think it would interfere with the value of the Green, and, therefore, the Committee thought that the power sought might be sanctioned. With respect to the resolution in the House on March 3rd, the powers to construct Tramways Nos. 3, 4 and 5 had been struck out of the Bill during its passage through the House of Lords. The time limit for the construction of the tramways was, to a great extent, dependent upon the new street and street widenings, and although the time proposed in the Bill—namely, seven years—was in excess of the period allowed by Standing Orders, they were of opinion that such period should be allowed.

Nottingham and Derby Tramways.—The Unopposed Bill Committee of the House of Commons has passed the preamble of this Bill. The object of the measure is to extend the time for the purchase of land and for the construction of tramways, and also to

provide for the transfer to the Corporation of Nottingham of certain powers to enable them to construct additional tramways and a tramroad and certain street improvements. The Chairman, in a report to the House, says that a report from the Local Government Board was laid before the Committee, and they had amended the clauses and struck out Article 10 of the agreement scheduled in the Bill between the company and the Corporation.

Metropolitan District Railway.—Sir Lewis McIver's Select Committee of the House of Commons, which has passed the preamble of the Bill, states in its report to the House, that it does not authorise the construction of any new railway or new works. The Bill enables the company to raise money necessary to carry on their undertaking by the creation and issue of prior lien debentures. It also proposes to authorise the company to abandon the construction of certain railways and portions of railways authorised by the Metropolitan District Railway Acts, 1897 and 1903.

LEGAL.

South-Eastern Railway Co. and South-Eastern and Chatham Railway Co.'s Managing Committee *v.* The National Telephone Co., Ltd.

This case came before the Court of Appeal consisting of the Master of the Rolls and Lords Justices Farwell and Kennedy on the defendants' appeal from a judgment of Mr. Justice Warrington.

In this case the plaintiffs claimed a declaration that the defendants were not at liberty to construct and were not now at liberty to use or maintain any pipes, cable, or telephone works in, upon, or over a bridge which crossed the plaintiffs' railway at Tonbridge Station, except upon payment of the annual rent of £30, and with the consent of the plaintiffs.

It appeared that the bridge carried a public road which was constructed more than 65 years ago by the road trustees of the day and was, by virtue of the Public Health Act, 1875, vested in the local authority and repairable by them.

In November, 1905, defendants, by an agreement with the plaintiffs, carried a telephone cable under the surface of the footpath of the road over the bridge and a few inches above the masonry of the bridge, the defendants agreeing to pay a rental of £30 a year. In January, 1907, the defendants wrote repudiating the agreement on the ground that the consent of the plaintiffs was not necessary. Plaintiffs thereupon commenced the present action for a declaration as stated.

Defendants contended that they were authorised by their statutory provisions to carry their cable across the bridge without the plaintiffs' consent, and that therefore as the agreement was without consideration they were not bound by it, or to pay the rent of £30 reserved by it. Mr. Justice Warrington held that the defendants were not authorised to construct the works without the consent of the plaintiffs, and granted the declaration as prayed. Hence the present appeal of the defendants.

After hearing the arguments of Mr. Roskill, K.C., and Mr. Gaine on behalf of the appellants, their Lordships, without calling upon counsel for the respondents, dismissed the appeal with costs.

Cross & Cross *v.* E. Mosley & Son.

In the King's Bench Division on Thursday, July 9th, before Mr. Justice Walton, an action was brought by Messrs. Cross & Cross, constructional engineers, of Bridge Street, Walsall, against Emmanuel Mosley & Son, contractors, of Gerard Street, Derby, to recover damages for alleged breach of contract for the supply and erection of iron and steel work for an electrical power station at Derby for the Corporation.

Mr. Hamilton, K.C., and Mr. Disturnal appeared for the plaintiffs, and Mr. Hugo Young, K.C., and Mr. H. A. McCardie were for the defendants.

Plaintiffs' case was that, under a contract contained in letters dated August, 1907, they agreed to sell and fix, and defendants agreed to purchase and pay for, certain iron and steel work necessary for the screen for the protection of the plant and machinery at the electrical power station of the Corporation of Derby. It was one condition of the contract that the work was to be according to plans and specifications, subject to variations in parts of the construction, and another was that the price was to be about £200. Plaintiffs purchased a large amount of material, and used a quantity which they had in stock, and did certain work upon it to make it fit for the screen, when, on or about November 5th or 6th, 1907, defendants by telegram and letter refused to accept the screen. The material and the labour which had been spent upon it consequently became wholly useless, and plaintiffs lost their profit upon the contract, and sustained damages.

Defendants admitted the contract, but asserted that it was an express term of it that the whole work was to be supplied, fixed, and completed by October 31st, 1907. Time was the essence of the contract. Plaintiffs, defendants complained, failed to supply or fix or complete the work by that date, and they claimed therefore to be entitled to rescind the contract. They denied that plaintiffs had sustained any damages, and said that they (defendants) had to erect at larger expense a temporary screen, and had to enter into a contract at a higher price with Messrs. Andrew, Handyside & Co., Ltd., to do the work which plaintiffs had failed to do. They, therefore, counterclaimed for damages.

Plaintiffs joined issue on the counterclaim, and said defendants altered the original plans and specifications, and failed to supply the necessary details, dimensions, and particulars, to enable them to carry out the work by October 31st, 1907.

His Lordship reserved judgment.

Brush Electrical Engineering Co., Ltd., *v.* West Hallam Colliery Co.

At the Notts Assizes on July 7th, before Mr. Justice Bray, plaintiffs sued defendants for £400, the price of an electric coal-cutter, which had been returned as useless. Mr. Hugo Young, K.C., and Mr. J. E. Pritchard, were for the plaintiffs, and Mr. H. Y. Stanger, K.C., and Mr. McCardie, for the defendants. According to the *Nottingham Express*, it appeared from the correspondence read by counsel that the defendants were unable to make the machine work satisfactorily. It did not cut at floor level, and defendants alleged that the cutter cost them 9s. a ton for coal, or three times as much as though the coal had been cut by hand. The machine was costing them from £60 to £80 a week. The plaintiffs contended that the machine would have worked all right had it been properly adjusted.

Mr. N. Taylor, civil engineer, who was employed by the plaintiffs at the time of the transaction, said that the average depth of the coal left on the floor for the whole of the seam was only about 3 in. He was of opinion that if the machine had been allowed time to adjust itself it would have worked satisfactorily.

Mr. F. W. Hurd, of Glasgow, stated that the machine could be adjusted to cut practically at floor level, and Mr. Andrew Cranford, colliery under-manager, formerly at the Digby Colliery, declared that the machine was made according to the plans. The cause of the difficulty in the present case was the hard "pavement."

Mr. Thomas Williamson, the manager of the West Hallam Colliery Co., said that the machine was given over a fortnight's opportunity. He did not once see it work at floor level, and knocking timber out made the work dangerous.

A consultation of the parties took place, as a result of which it was agreed that judgment should be entered for the defendants with costs on the claim, and also for the defendants for £25 with costs on a counterclaim.

Harrison & Co. *v.* Goodwin.

In the Marylebone County Court on Monday, Messrs. Harrison and Co., electrical engineers, 35, Broadway, Cricklewood, sued Mr. John Morris Goodwin, of 4, Devonshire Villas, Brondesbury, to recover £6 14s. 6d., balance of an account for electrical work done. Mr. Nonweiller, who appeared for the plaintiffs, said that defendant had asked plaintiffs for an estimate for putting up the electric light to a villa, No. 2, North Mansions, which had been let to a tenant desirous of having the light introduced. An estimate was furnished, and the work commenced, and later on, as the tenant was anxious to enter in possession, defendant asked him to expedite the work. He did so, and the whole was completed by July 16th last year. After its execution, the defendant refused to pay the account because the Willesden District Council had declined to supply the light, stating that their mains had not been brought up to the premises by 80 or 100 yd., and they took up the position that they were not justified in incurring the expense of carrying the main to defendant's premises—the flat being the only house for which the supply was required. Mr. Harrison, the head of the plaintiffs' firm, was called, and bore out this statement. In cross-examination by Mr. Goodwin, he denied that he undertook to get the District Council to supply the electric light. He did not wait for them to supply the light, because the defendant pressed him to have the work done before the tenant went in. The tenant, Mr. Crane, signed the application form to the Council to supply the light. Up to the present the mains had not been extended. For the defence, Mr. Goodwin said that his agreement with the plaintiffs did not include his getting the Council to supply light. The fittings as put up were useless without the supply, and he said that plaintiffs ought not to have gone on with the work till the will of the District Council had been ascertained. Mr. Bruce, electrical engineer to the Willesden District Council, stated that an application had been received from Mr. Crane, but his board did not feel justified in taking the main to the defendant's premises, as the return to be obtained from the supply would be so small. His Honour held that the plaintiffs had not contracted to do more than put up the fittings, and gave judgment for the plaintiffs with costs.

Ellison *v.* Manchester Corporation.

At the Manchester Assizes, before Mr. Justice Bucknill, on Monday last, an action to recover damages under Lord Campbell's Act was brought against the Corporation of Manchester by Leah Ellison, pawnbroker, &c., of Great Ducie Street, Strangeways. The plaintiff claimed damages for the loss of her husband, who had been suffocated by an escape of gas, which found its way into his house from an outside main on the night of March 16th. Negligence on the part of the Corporation was alleged. This, however, was denied, and the defendants pleaded that Mr. Ellison's death was due to natural causes. Counsel in the case were Mr. Ambrose Jones and Mr. Horowitz for the plaintiff; and Mr. Sutton for the defendant.

On behalf of the plaintiff, the evidence was that about 2.30 on the morning of March 16th the family were aroused by a strong smell of gas which pervaded the whole house. Mr. Ellison had been unwell, and as he was rendered unconscious by the fumes, he was removed to the Royal Infirmary. He died on April 1st, and it was contended that his death was accelerated by the inhalation of coal gas. On investigation, it was found that the escape had been caused by the fusing of an electric cable, which passed the premises and belonged to the Corporation.

It had already been held, counsel said, that where an electric cable fused and caused personal injury, the owners were liable for damages; but, in this case, the Corporation denied that it was that circumstance which contributed to Mr. Ellison's death.

Before the evidence was completed, the Manchester Corporation consented, through counsel, to judgment being entered against them for £125 and costs, the money to be paid to the plaintiff, as executrix of her late husband.

CARTER *v.* BRITISH THOMSON-HOUSTON CO., LTD.

AT the Newcastle-on-Tyne County Court on the 14th inst., before Judge Greenwell, Lily Carter, a teacher of cookery at Blaydon, sued the British Thomson-Houston Co., Ltd., electrical engineers and manufacturers, for £21 in respect of articles which the plaintiff had, it was contended, written for a pamphlet to the order of the defendant company. Mr. Tait appeared for the plaintiff, and Mr. Grunhutt for the defendants.

MR. TAIT said that plaintiff had lectured at cookery exhibitions, and had devoted a good deal of attention to the question of cookery by electricity. For 18 months she had contributed a series of articles to the *Tyneside Electrical Pioneer*, which he believed was the official organ of the Newcastle Electric Supply Co. Negotiations were entered into between the defendants and the Newcastle Supply Co. with a view to the former obtaining an interview with Miss Carter. In December last the plaintiff saw Mr. Booth, of the defendant company, and he explained that they were the manufacturers of a domestic appliance known as a chafing dish. They desired to push the sale of it, and he asked Miss Carter to write articles on it and the food that might be cooked in it. Plaintiff agreed, and said that her terms were 30s. a page. The articles were eventually written, and the claim was for 14 pages of printed matter at 30s. per page.

MR. GRUNHUTT said that the defendants' point was that the terms of 30s. a page were not accepted, and another arrangement was made.

The PLAINTIFF bore out her counsel's statement, and in cross-examination, said that she had been offered £5, but had declined it.

MR. GRUNHUTT said the 30s. a page was an estimate, but it needed acceptance by his clients. They offered £5, which was not accepted, and the MS. was returned to her.

FRANK WILLIAM BOWRAN, district engineer for the defendants, gave evidence as to an interview with the plaintiff. He told her he could not come to terms, but suggested that she might draft a pamphlet to be forwarded to the head office, and they would make her an offer.

Further evidence was to the effect that the plaintiff did not know what to charge, and the matter was left to the head office of the defendants to make an offer.

His HONOUR found for the plaintiff for the amount claimed, the recipes written by the plaintiff to be given to the defendants.

Manchester Exhibition.—We are informed that at the last meeting of the Committee of this Exhibition, it was resolved to make certain alterations in connection with the buildings in order to provide further space accommodation. This is necessitated by the number of allotments already made.

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

B.T.-H. Tungsten Patent Lamps.

Glow lamps with tungsten filaments are now being manufactured at Rugby by the British Thomson-Houston Co., Ltd., of the pattern shown in the accompanying figure (fig. 3). The lamps have an efficiency of 1·25 watts per British Parliamentary standard candle, burn in any position, and are suitable for use on both A.C. and D.C. circuits. For 100-125 volts, they are at present made in one size, consuming 50 watts and giving approximately 40 C.P.; 25 and 50-volt lamps are also made for use with transformers on A.C. circuits, the former in two sizes (12½ and 20 watts), and the latter in one only (20 watts). The B.T.-H. Co. have been engaged for a long time in elaborate experiments, in order to ensure that their lamp shall be of high quality, and they undertake to defend all claims against users for infringement of British patents in respect of their tungsten lamps. The lamps are guaranteed against breakage in transit, when delivered in standard casks, whatever the quantity. Fig. 2 shows the B.T.-H. lamp assembled with a Holophane shade and gallery, forming a neat pendant fitting.

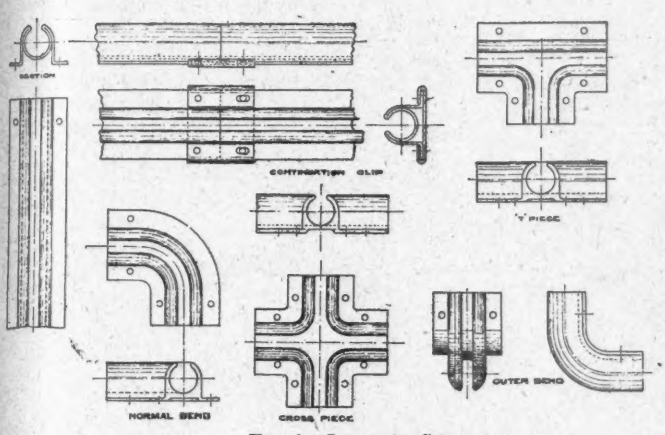
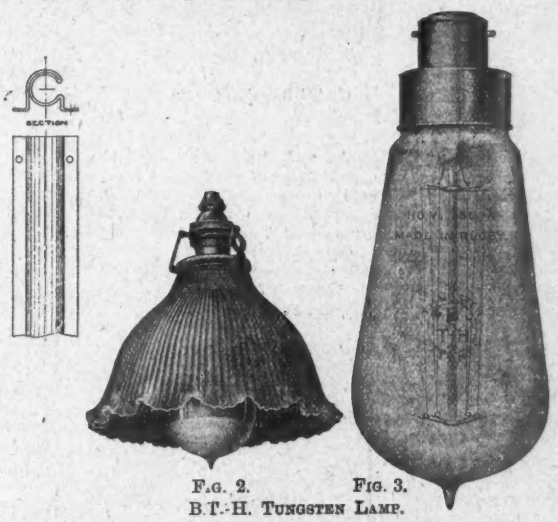


FIG. 1.—IMPROVED CONDUIT.
The right-hand detail shows an alternative design.



F.G. 2. FIG. 3.
B.T.-H. TUNGSTEN LAMP.

Improved Electric Conduit for Surface Work.

The accompanying illustrations (fig. 1) show the details of a new form of conduit that has been provisionally protected, for use more especially for interior surface wiring. Briefly, the conduit consists of a gapped tube, the gap being smaller than the maximum internal diameter of the tube, with flanges for fixing purposes. The wires are laid in the conduit, and are held within it by the natural twist in the wires "taking up" within the conduit.

The conduit is made continuous by means of one type of clip only, which is also used to attach tees, bends, inspection boxes, &c. The conduit is fixed by screws or nails through the flanges, which are punched where required.

The back of the tube is kept clear of surfaces by the flanges, which allow air to pass freely all round the conduit, and thus prevent unequal temperature within the tube, the cause of most condensation and corrosion troubles. Sudden changes in temperature which set up condensation, &c., will also quickly disperse the same, the gap acting as a natural ventilator. Alterations and additions can be easily carried out, because it is only necessary to pull out wires from any length of conduit at the point of alteration or addition, and after inserting the necessary box, tee, or bend, all the wires can be replaced quickly with an enormous saving of time and labour. The inventor is MR. G. G. SARNEY, of 16, Chaucer Road, S.E.

The "Sirius-Efesca" Tungsten Lamp.

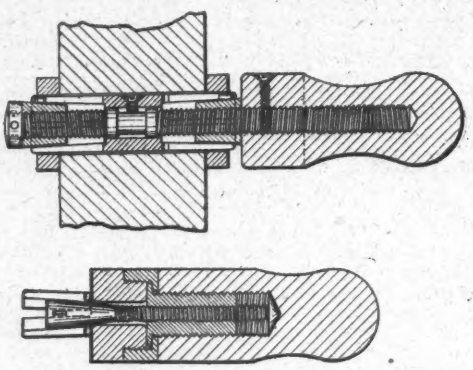
MESSRS. FALK, STADELMANN & CO., LTD., of 83-87, Farringdon Road, E.C., are introducing under this title a patent metallic-filament lamp, for which an efficiency of 1·1 watts per candle is claimed. This lamp is made for pressures up to 130 volts in various candle-powers (not less than 25 C.P. from 100 volts upwards); it will burn in any position. We have a couple on trial, burning in series in a nearly horizontal position, on 200 volts, and so far they are perfectly satisfactory. The lamps are guaranteed not to infringe patents claimed for other types, and it is stated that the patent process under which they are manufactured renders them less liable to breakage of the filament than other types, while a life of much more than 1,000 hours with very little diminution in candle-power is obtained. Lamps packed by the makers in quantity are guaranteed against breakage of filaments in transit, except for export.

"S.B." Contact Plugs.

The want of a contact plug which can be depended upon to secure good contact, without wear or liability to become loose, while avoiding the necessity of an accurate fit and uniform size of

plug and socket, has long been felt, and the device which we describe below will be welcomed by all users. It is being placed on the market by MESSRS. G. A. STEINTHAL & BOYDELL, LTD., of 41, Piccadilly, Bradford, from whose shop it originated, and it is, of course, patented.

The plug is of the expanding type; it is readily inserted into the socket or sockets, and is then tightened to any desired degree



FIGS. 4 AND 5.—"S.B." CONTACT PLUGS, IN SECTION.

by rotating the handle, a right and left-handed screw which draws taper sleeves into the interior of a split tube providing the outward pressure, as shown in the sectional drawing, fig. 4. The plug is removed by rotating the handle in the opposite direction. The sockets are drilled "parallel," and need not be precisely accurate in size. For connecting bus-bars on the front and back of a switch-board, and for similar purposes, the plug is made double-ended; for single contacts, jumpers, &c., a single right-hand screw and sleeve suffices (fig. 5), and a cable-sweating socket is provided on the

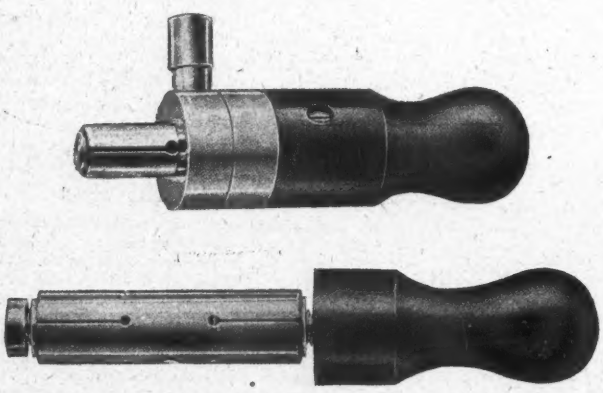


FIG. 6.—"S.B." CONTACT PLUGS.

shoulder of the plug. The sleeve is prevented from rotating with the screw by a small fin, which slides freely in one of the slits in the tubes.

The device was, we believe, invented for use on plug-boards such as are employed in technical colleges, laboratories, &c., but is applicable to all cases where large currents have to be distributed in varying paths, and leaves little to be desired in efficiency and convenience.

A Self-Lubricating Trolley-Wheel.

One of the principal causes of trouble with trolley-wheels is insufficient lubrication; when not properly lubricated, the wheel wears down very quickly, and in addition causes the wire to wear down. To overcome these drawbacks an Italian engineer, Signor Molteni, Inspector of the Milan Tramways, has designed the self-lubricating trolley-wheel represented in the accompanying figures. Owing to the satisfactory results obtained with this trolley-wheel, the Società Italiana Edison di Elettricità has decided to adopt it exclusively.

The wheel (fig. 7) comprises three parts, viz.: the wheel proper *a*, which is made of gun-metal; the bush *b*, made of hardened steel; and the pin *c*, which is likewise made of hardened steel.

In the interior of the wheel there is a compartment which, after fixing the bush, is filled with oil, vaseline, or some other lubricating substance, by slightly heating the latter and pouring it on the holes of the bush, the hole of the pin being kept vertical. The lubricating oil then flows on to the pin through specially arranged channels, while other channels cause it to flow back to the reservoir, keeping up a continuous circulation.

The wear and tear of the trolley wire is said to be reduced to a minimum, while a considerable saving is effected in the course of operation. As there is no necessity for oiling the wheel, superintendence is greatly reduced.

According to experiments so far made, the Molteni wheel can be used 72 days successively without any renewal or repair, the wear being even throughout the surface. While in the old type of wheel the wear on the pin was so great as sometimes to require

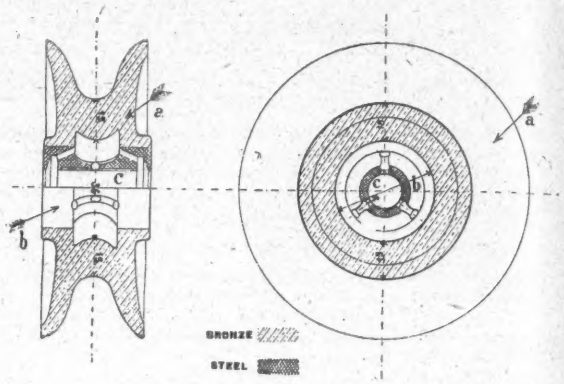


FIG. 7.—MOLTENI TROLLEY WHEEL.

renewal twice as often as the bush, the pin and steel bush of the Molteni wheel have been found to last at least six times longer than the wheel itself. Bushes that have been in use for more than a year are as good as new.—A. G.

The "Watkin" Switch.

This is a new patented apparatus for economising electric current, which is being marketed by MESSRS. ADAMS & CO., 109, Victoria Street, S.W. It consists of a switch resembling the tumbler type in outward form, combined with a series of graphite resistances held in frames and composed of short rods laid side by

FIG. 8.—THE "WATKIN" SWITCH.

side and pressed together by screws. The dolly of the switch is connected with a rocking lever, which carries at the inner end spring pistons such as are used in lamp-holders, travelling over contacts connected with the graphite resistances. The switch has seven steps, enabling the user to obtain a corresponding number of degrees of illumination when the apparatus is connected in series with a lamp—the main purpose of the device; the last step reduces the current to one-fifth of the maximum, and the light to a mere glimmer, suitable for a night light. The switch can be used either in series with the ordinary switch, or in place of it, and is very neat and compact, while the internal construction is excellent. It is claimed that when this device is used, electric light becomes as cheap and as easily regulated as gas; the switch can be adjusted to suit any ordinary voltage and to carry a maximum of 260 watts. Besides controlling lamps, many other functions, such as regulating the speed of fans, motors, &c., can be fulfilled by this apparatus, which, as shown in fig. 8, is of ornamental design, and occupies only $4\frac{1}{2} \times 6\frac{1}{2}$ in.

Dartford Electricity Supply.—The R.D.C. has received notice from the South Metropolitan Electric Light and Power Co. of its intended application to the B. of T. for a prov. order authorising the supply of electricity in the Council's district.

BUSINESS NOTES.

Lifting Magnets for Plate Glass.—An electrical device has been introduced in Philadelphia for the handling of large sheets of plate-glass for shop windows, &c. Heavy magnets are placed against the glass on one side, while on the other are flat plates of iron or steel, the magnets holding the plates through the glass. A heavy plate of glass can thus be handled with ease, using as many magnets as may be required; each magnet is connected with a source of electric current, which can be cut off when necessary to release the glass plate.

Book Notices.—*Agenda de l'Electro*, 1908. Brussels: *L'Electro*. Price 5 fr.—Belgium has hitherto been without a single electrical pocket-book of home production. To us, who are overwhelmed with such, this must seem a matter for astonishment. *L'Electro* now supplies the deficiency by producing a neat little volume, opening normally, printed on thin paper, convenient for the pocket (but who ever carries these books in his pocket?) and as regards its contents extremely comprehensive. Unfortunately, like so many Continental works, it lacks the first essential of a handy reference book—it has no index. Besides electrical matters, many mechanical are dealt with, and the electrical field ranges from lighting and power to telegraphy and electrolysis; particulars are also given of Belgian regulations, patent law, colleges and schools, electricity works and tramways, &c. It is a very nice little book, but it ought to have an index next time.

Aldum's Mathematical Tables. London: E. and F. N. Spon. Price 4d. net.—This is a very neat set of four-figure logarithms and antilogarithms, with trigonometrical ratios and useful constants, folded up into an extremely compact form, about $6\frac{1}{4} \times 4 \times \frac{1}{10}$ in. The covers are of stiff cardboard. The tables are quite suitable for most engineering purposes, and especially for the use of students.

"Proceedings of the American Society of Civil Engineers," May, 1908. Vol. XXXIV, No. 5. New York: The Society.

"Journal of the Institution of Electrical Engineers." July, 1908. Vol. 41, No. 190. London: E. and F. N. Spon, Ltd. Price 5s.

"Fire Tests with Fire Extinguishers." The Committee's Report on the "Diamond" Dry Powder Extinguisher. "Red Books" of the British Fire Prevention Committee. No. 127. London: British Fire Prevention Committee. Price 2s. 6d.

Fire.—A fire occurred on Tuesday on the premises of the A.C. Electrical Co., in Cock Lane, Snow Hill, London, E.C., through the overturning of a spirit lamp.

Catalogues and Lists.—Messrs. Simplex Conduits, Ltd., Birmingham.—Leaflet showing some new designs of brass and copper electric kettles and saucepans. Reductions in the prices of their electric kettles are announced.

Messrs. A. P. Lundberg & Sons, Liverpool Road, London, N.—Three new publications: one dealing fully and diagrammatically in the firm's usual admirable manner, with the "Tripin combination" switch and wall connection; the second is devoted to the "pivot" tumbler switch, while the third is concerned with the "pivot intermediate" switch. Each of the lists contains a note of prices.

E.M.F. Manufacturing Co., 10, Ironmonger Lane, Cheapside, E.C.—Six-page illustrated circular giving particulars with prices of Siemens tantalum lamps, also adapters and fittings for the same.

Messrs. L. Weil & Reinhardt, Mannheim.—From Mr. O. Rühl, of 6 and 7, Redcross Street, E.C., who, we understand, is now the sole agent for the British Empire, we have received an illustrated pamphlet concerning the system of protected cable troughing, of which we gave a description on page 95 of the Electrical Review for January 18th, 1907.

Messrs. Ludw. Loewe & Co., Ltd., Farringdon Road, E.C.—Pamphlet F (14 pages) giving notes on circular milling and particulars of the firm's circular milling machine. Any reader interested can obtain a copy on application.

The International Electric Co., 55, Redcross Street, E.C.—New edition (18th) of their bell and telephone list, in which in the course of some 34 pages are published illustrations and prices of many varieties of electric bells, pushes, indicators, wires, &c., also batteries, alarms, and telephone instruments and materials.

Messrs. Crompton & Co., Ltd., the Arc Works, Chelmsford.—New brochure dated June, the contents of which consist almost exclusively of half-tone typical views of the works, exterior and interior, showing various classes of electrical machinery, lamps, &c., in course of manufacture, and of views of finished manufactures such as electric generators, capstans, pumps, winding engines, and electric lamps. A number of the pictures show the Madras and Cawnpore electric generating stations and their equipments.

Messrs. Gent & Co., Ltd., Faraday Works, Leicester.—Leaflets giving prices of "Refulgent" incandescent lamps, "Tangent" brand electric light wires and cables, and electric syrens for fire alarms, collieries, &c.

The Sterling Telephone and Electric Co., 200, Upper Thames Street, London, E.C.—Pamphlet No. 132 (48 pages) in which are given brief particulars and prices, with many illustrations, of the firm's various lines in telephone instruments and apparatus for all classes of service, also mining and other bells, indicators and accessories.

The Cambridge Scientific Instrument Co., Ltd., Cambridge.—Several new lists have been issued in expanding binding case. List No. 52 is a 50 odd page publication in which are well shown and described a variety of physical instruments, the matter being divided up into the following sections:—General laboratory equipment; special and angular measurement; recording and time-marking apparatus; mechanics; sound, light, and heat; magnetism; and examples of special apparatus. List No. 53 is also a 50-page catalogue, but it is devoted exclusively to electrical instruments, these including various galvanometers; Duddell's thermal instruments, thermo-galvanometer and thermo-ammeter; fluxmeter, Duddell's magnetic standard; galvanometer telescope and scale, mirrors and lenses, and suspensions, &c. A leaflet (No. 54) describes the Cambridge extensometer, and a further pamphlet deals with the Callendar and Griffiths's self-testing bridge.

Messrs. Geo. Robson & Co., Sheffield.—New catalogue of labour-saving machinery, in which clearly-illustrated brief descriptions appear of their barrel elevators, spiral conveyors, adjustable hangers, double-deck travellers, ball bearings, &c. A separate pamphlet contains an article describing their latest Eclipse portable grinder for tramway track maintenance work. We understand that a large number of these grinders have been supplied, and that the firm have received an order from Rotherham Corporation for one fitted with drilling and sawing attachment.

Langbein-Pfanhauser Works, Ltd., 18-26, Constitution Hill, Birmingham.—Circular relating to their solutions and outfits for electro-plating and electrotyping.

Bankruptcy Proceedings.—T. A. Evans, Swansea.—The first meeting of creditors was held on Thursday, July 9th, at the offices of the Official Receiver, Swansea. Gross liabilities were estimated at £2,699, expected to rank £1,697, assets £68, deficiency £1,628. Speculation in a colliery undertaking at Sowerton was the cause assigned for the failure. No creditors were present, and the Official Receiver remains trustee.

Dissolutions and Liquidations.—Geipel & Pyman, electrical engineers and contractors, West Hartlepool.—Messrs. E. Geipel and A. A. Pyman have dissolved partnership. Mr. Geipel will attend to debts and continue the business under the old style.

Mica Boiler Covering Co., Ltd.—A winding-up order was made on July 7th.

Kevan Electric Co., Ltd.—First meetings of creditors and of contributories, are to be held on July 28th, both at 33, Carey Street, W.C.

Annual Sports.—The Robertson Electric Lamp Co.'s Social and Athletic Club held their second annual sports at Pond Meadow, Ealing, on Saturday, 11th inst. There was a large attendance, and a programme of some 24 items was got through very smartly, the time-table being closely adhered to. Music was provided by the Enfield Town Silver Prize Band during the afternoon. An excellent concert was given by members of the Choral Society, and dancing was indulged in till a late hour. The prizes were presented by Mrs. C. Wilson.

Trade Announcements.—We are asked to state that Mr. J. Sambidge and Mr. E. W. T. Ward, having severed their business interests, are no longer trading as Sambidge & Ward. Mr. Ward continues to represent the Victoria Dynamo and Motor Co. at 17, Victoria Street, S.W.

Mr. W. H. Keys, of Hall End Works, West Bromwich, announces that for purely family reasons he has converted his business into a limited liability company, under the style of W. H. Keys, Ltd. No shares have been or will be offered to the public, and the management will be the same as heretofore, Mr. G. H. Shakespeare continuing as a managing director.

Messrs. Scholes & Co. have removed to 4, Corporation Street, Manchester.

Messrs. Cunningham & Morrison, of Balfour House, Finsbury Pavement, E.C., are now sole London and district agents for the Premier Electric Lamp Co., of Huyton Quarry, near Liverpool.

Messrs. Cowans, Ltd., whose works at Salford were destroyed by fire in January last, announce that the works are now completely reconstructed and equipped, and able to give prompt delivery. A circular in which they announce this fact to the trade contains a photographic view of the switch-shop of the new works, as seen on April 18th last, when the works were in full swing; also an illustration of some of their E.H.T. and H.T. switchgear installed at the Franco-British Exhibition.

Annual Outings.—On Saturday, the 4th inst., Simplex Conduits, Ltd., held their annual works outing at Matlock Bath, the excursion being attended by some 200 of the employés, together with the various departments and branch managers. An early start was made from Birmingham, and the usual sports were completed before luncheon. For the tug-of-war event, the prize was a challenge cup, presented by the managing director, Mr. L. M. Waterhouse, which was eventually won by the Birmingham "office" team, who just beat "The Forwarding Department." After lunch, when the prizes were presented by Mrs. Sheppard, wife of the works manager, the party broke up, and various excursions on the river and in conveyances to Haddon Hall, and other places of note in the district, occupied the time until the return to Birmingham in the evening.

The annual outing of the employés of the Bromley Electric Light and Power Co. took place last Saturday week, Margate being visited.

The employés of the Greenock Corporation Electricity and Destructor Departments held their annual excursion to Millport, Cumbrae, on June 20th, in beautiful weather. The party numbered about 100, and included treasurer N. M. Brown, convener of the Electricity Committee; Bailie J. W. Bennett, convener of the Destructor Committee; Mr. J. A. Robertson, M.I.E.E., burgh electrical engineer. On arriving at Millport, dinner was served in the Masonic Hall, and thereafter an adjournment was made to the

Public Park close at hand, where a programme of sports was gone through. On returning to the Hall, tea was served and the various prizes for the sports were presented by Mrs. Robertson. After remarks by Treasurer Brown, Bailie Bennett and Mr. Robertson, the party returned by steamer to Greenock.

On Thursday, July 9th, the staff of the Tramways and Electrical Department of the Pontypridd U.D.C. held their second annual outing. The Council granted the staff two days' holiday, and 45 of the employés availed themselves of the concession. They left Pontypridd for Barry, *en route* for Ilfracombe, in charge of Mr. J. E. Teasdel, the manager of the department, assisted by Inspector Miles. The channel passage was somewhat stormy. Glorious sunshine prevailed throughout the whole day, and the party lunched at the Monte Bello Hotel. After a stay of several hours in Ilfracombe, the party re-embarked for Barry.

The employés of MESSRS. BROWETT, LINDLEY & CO., LTD., Patricroft, held their annual picnic on Saturday last, when a party of about 130 journeyed to Llandudno. The party included Mr. F. C. Gibbons, managing director, and Mr. T. G. Kay, the secretary. Llandudno was reached about 10.30, which allowed a short time for looking round the town before lunch, some of the party getting as far as the Happy Valley. Luncheon was taken at the Grand Hotel, and in the afternoon a large number went down the Menai Straits on board the steamer *La Marguerite*. Unfortunately, however, rain fell heavily during the whole of the afternoon. Tea was subsequently served at the Grand Hotel, and a short time was spent in toasts and speeches. Mr. Gibbons proposed "The Royal Family"; "Browett, Lindley & Co., Ltd.," was then proposed by Mr. Kay, supported by Mr. W. G. Terry, and Mr. Gibbons suitably responded; Mr. J. Hulme proposed "The Employés," this being supported by Mr. Albert Brittain, and Mr. Kay replying; "The Committee" was proposed by Mr. F. R. Ashworth, and supported by Mr. H. Smith, Mr. J. Myles, who had acted as secretary and treasurer of the picnic, replying on behalf of the Committee.

On Saturday, 11th inst., the employés of MESSRS. RAWLINGS BROS., LTD., of Gloucester Road and Belgravia, journeyed to Southsea, on the occasion of the annual outing. The party numbered nearly 100. Dinner was provided at the Portland Hotel. Mr. W. R. Rawlings, one of the managing directors was in the chair. The toast of "The Employés," given by the chairman, was responded to by Mr. A. Sharp. As the day was fine, the speeches and the toasts of "The Firm and Directors," proposed by Mr. T. S. Howden, and responded to by the chairman; and "The Visitors," proposed by Mr. E. C. Nicholson, and responded to by Messrs. Milton and Clarke, were kept as brief as possible.

On Saturday, July 11th, the employés of FERRANTI, LTD., went for their annual outing to Scarborough. At the close of the midday meal, presided over by the managing director, Mr. A. B. Anderson, a very cordial vote of thanks to the directors for their contribution towards their outing was proposed by Mr. Campion and seconded by Mr. Hibbertson. The chairman, in replying, referred to the "hard times," and said that the reason why they did not get as much work as they would like, why they did not employ a great many more men than they did, why they were not making sufficient money to exploit more markets, was "foreign competition." Having spoken of the hard times for the industry generally, however, he was glad to be able to say something on the other side for their own company. During the whole course of his connection with Ferranti, Ltd., some 16 or 17 years, there had never been less cause for anxiety than there was to-day. The company had had its bad times. It fell into the hands of the receivers, and it climbed out again. In the first half-year of the reconstructed company it made a considerable loss, the next half there was no loss, and since then there had been a steadily increasing profit. He hoped that, as the years went on, he would meet them in that manner at least once a year, and in increasing numbers, and that on each succeeding occasion he might be able to give them a better report. The company was employing to-day just about the same number of men as when it had an engine and dynamo shop in addition to the switch and meter works.

On Saturday last the staff of the Eastbourne Corporation Electricity Department had their annual outing by motor, the place selected being the picturesque village of Heathfield. A start was made at 7 a.m., and breakfast was partaken of at Hailsham. The weather being fine and the roads in fair condition, a good pace was made, and the party reached their destination about 11 a.m. After light refreshment, a cricket match took place between teams composed of the inside and outside staffs, the inside men showing their superior cricketing powers and winning fairly easily. After the match, dinner was served at the Star Hotel.

The annual outing of the employés of the ANTI-ATTRITION METAL CO., LTD., of London, took place on Saturday, 4th inst., when a visit was paid to Littlehampton. A large number were present.

The staff of MR. W. D. WILLSON, electrical and gas engineer, Croydon, went for their annual outing on Saturday last to the hills of "Holmwood," Dorking, Surrey. The party returned *vid* Reigate, the brake being brilliantly illuminated by Osram lamps.

The annual outing of THE SUN ELECTRICAL CO., LTD., took place on Saturday, July 11th, in the form of an Up-River Trip to Hurley. The electric launch *Rosalind* left Maidenhead Bridge at 10.15 a.m., luncheon being served at "The George and Dragon" Hotel, Marlow. The toast of "The King" having been duly honoured, Mr. A. G. Beaver, the manager, proposed "The Sun Electrical Co., Ltd." He referred to the increasing prosperity of the company, and thanked the staff for their loyal co-operation. He also expressed his satisfaction with the success which had attended the introduction of the "Kalkos" system of tubing during the past year, and predicted a great future for it. Tea was partaken of at "Ye Olde Bell," Hurley.

LIGHTING and POWER NOTES.

British Columbia.—Mail advices from Victoria, B.C., give particulars of a new installation of salt water protection against fire inaugurated by the British Colombian Electric Railway. Sea water is pumped by electricity to a high level basin, from where it can be laid on in the usual way. A similar installation is about to be made for the protection of the City of Victoria against fire risks.

Chipping Norton.—The local E.L. and power company has informed the T.C. that it is applying to the B. of T. for a prov. order for electric supply.

Continental Notes.—NORWAY.—The work of harnessing the Rjukan waterfalls, the highest in Norway, from which the power for one of the Birkeland-Eyde works for manufacturing nitrogen from the air is going to be supplied, is in full progress. A contract for the welded parts of the water pipes has just been concluded with some manufactories in Ober-Silesia. This is said to be the largest contract for water pipes that has ever been made, and the water pipes are of dimensions unknown up to the present. Through these pipes the water from the Lake Mösvand is going to be conducted for a distance of 700 metres from the reservoir destined for distributing the water, to the power station. The whole plant will comprise 10 large turbines, each of a capacity of 14,000 H.P. These turbines will be the largest in the world, as those at Niagara Falls are only of a capacity of 11,000 H.P.

ITALY.—Application has been made to the authorities of the Province of Caserta for a concession to put down a plant to utilise the water-power of the River Garigliano at Roccadevandro in the generation of electrical energy for lighting and power purposes.

AUSTRIA.—It is announced that the municipal authorities of Vienna have completed negotiations for the purchase of the collieries of the Ostran Bergban Gesellschaft, in Bohemia, in order to supply therefrom the coal required by the electric lighting and gas undertakings in the Austrian capital.

SWITZERLAND.—According to the *Standard* a 16-mile 27,000-volt transmission line has been brought into use between Obermatt and Lucerne. Four 2,000-H.P. Pelton wheels coupled to 6,000-volt three-phase generators, are installed at Obermatt. The transmission line is in triplicate, one line being regarded as spare, and is carried for the most part on lattice steel towers spaced 170 ft. apart. Every transmission tower is earthed through a 5-mm. copper wire carried some 7 ft. below the transmission cables, and connected at every tenth pole to a copper earth plate having an area of 10 sq. ft. Several small sub-stations are supplied, but the chief one is at Steghof, near Lucerne.

Ealing.—At the meeting of the T.C. on Thursday, the town clerk reported the result of the proceedings against the Ealing Hippodrome for having supplied Messrs. Lipton's, Ltd., with electricity. In view of future action, the matter was discussed in private. At the Police Court hearing at Brentford it was stated that an arrangement was entered into by the T.C. with Mr. Walter Gibbons for the supply of electricity to the Hippodrome on special terms. There was a restaurant attached to the Hippodrome, but the energy for this was charged separately. Subsequently the restaurant was closed, but reopened again by Messrs. Lipton. Mr. Gibbons supplied them with energy, and the effect was to put the Council in the position of supplying electricity in bulk, which it had no power to do. For the defence it was urged that the agreement entered into with the T.C. by Mr. Gibbons covered the whole of the buildings at the Hippodrome. Mr. Gibbons, giving evidence, said when he first took over the Hippodrome he approached the Council with a request to be supplied at cheaper rates. He was refused, and thereupon obtained expensive machinery to generate his own current. Before it was installed the Council came to him with an offer to supply at a lower rate, and he got rid of the machinery at a loss of £250. The Bench held that a technical offence had been committeed but decided to dismiss the information under the powers of Sec. 1 of the Probation of Offenders' Act, 1907, on payment by the defendants of two guineas costs.

Edmonton.—The B. of G. at the last meeting decided, on a report by Messrs. May & Hawes, of Westminster, to enter into a five years' agreement with the North Metropolitan Co. for the supply of energy for power and lighting to the new infirmary at 2½d. per unit.

Farnworth.—At a L.G.B. inquiry held on the 7th inst., it was stated that the local Council proposed to install additional plant at its Albert Road works, and to take a bulk supply from the Lancashire Electric Power Co. with whom it had entered into an agreement to take 400,000 units per annum. The Council proposed spending £7,000 on the scheme, including £1,281 for new buildings, &c., £2,500 for transforming plant, £450 for switchboards, £300 for battery extension, &c.

Feltham.—At the last meeting of the U.D.C. the Drainage Committee submitted a scheme for drainage by electric pumps. The Committee recommended that Mr. Midgley Taylor, of Westminster, be employed to advise as to the best scheme for sewage disposal, including, if practicable, arrangements for street lighting by electricity. The recommendation of the Committee was carried with the proviso that Mr. Taylor should also give an estimate of the cost of electric lighting. Notice was

received from the United Electric Supply Co. of its intention to apply for a prov. order to supply current in the Feltham district and the surrounding areas.

Fleetwood.—The destructor cells, which have now been in use continually for eight years, are to be pulled down and rebuilt in conjunction with a larger boiler. The work has been let to Messrs. Hughes & Stirling, of Bootle and London, to the specification of Mr. Oswin Hansom. It is expected that by bringing the destructor up to date it will be capable of supplying sufficient steam to generate 200,000 units per annum.

Hampton Wick.—The U.D.C. has decided to formally dissent from the application of the United E.L. and Traction Co. for a prov. order for electric lighting.

Hastings.—The accounts for the year ended March 31st last have been presented this week. The gross profit for the year is £8,043. The net result of the year's working, however, is a deficiency of £2,982. The total income for the year ended March, 1908, was £17,833, as compared with £19,766 for the year 1907. The total expenditure (apart from sinking fund, &c.) for 1908 was £9,790, as compared with £9,160 in the previous year. The debt outstanding on March 20th last was £125,449.

Hemel Hempstead.—The United E.L. and Traction Co. has informed the T.C. that it intends applying for a prov. order for E.L. The matter is being considered by a Committee.

Heywood.—The growing demand for electricity both for lighting purposes, for power, and for the use of tramways, has made an extension of the Corporation Electricity Works necessary, and at the meeting of the T.C. on Thursday, July 9th, a resolution was submitted and approved authorising an application to the L.G.B. for sanction to borrow £16,008 for extensions and new plant.

Isle of Thanet.—At a meeting of the R.D.C. on July 9th, notice was received from Messrs. Foote & Milne of their intention to apply for a prov. order for E.L. in the Council's area. No action was taken in the matter.

London.—Southwark.—A notice of motion to sell or lease the municipal electric undertaking, and a request for more money for free wiring, caused a full muster of Progressives on Wednesday, the absence of many opponents of municipal trading giving the former a temporary majority. The Electric Lighting Committee reported that the £1,000 voted for free wiring was practically spent, and £250 more would be necessary to carry out orders in hand. Councillor Scriven moved that the report be referred back with instructions to the Committee not to spend more than the £1,000 voted, on the ground that the experiment had been tried for 1½ years, and no genuine report had ever been made showing that it had been a success. Councillor the Rev. W. J. Sommerville seconded. In the course of a heated debate, Councillor Cook, the Progressive Chairman of the Electric Light Committee, contended that a profit of 12½ per cent. was being made on the free-wiring outlay. Councillor Scriven's amendment was defeated by 32 to 23 on a show of hands, and by 29 to 26 on a division. Later on, Councillor Scriven moved—"That a Committee be appointed to inquire and report to the Council on what terms the electrical undertaking of the borough can be sold or leased, having due regard to the interests of the ratepayers of Southwark, the consumers, and the employés." However, it was now 9 p.m., after which no opposed business can be taken, and the motion, being opposed, stands over for discussion on July 22nd.

Marylebone.—The Lighting Committee of the B.C. has received a petition from 39 ratepayers and residents of Church Street for the lighting of that street by electricity. The petitioners have been informed that the matter is under consideration in conjunction with the proposed lighting of other streets in the borough by electricity.

Mansfield.—The Electricity Committee of the T.C. reports that the undertaking continues to make satisfactory progress. The gross profit on the past year's working amounts to £3,979, and the net profit £553. The actual working results are £1,000 better than in the previous year, but this has been largely neutralised by various extra charges. It has been decided to pay over in relief of the district rate the sum of £500 out of the net profits.

Marlborough.—The Marlborough Electric Supply Co. has informed the T.C. that it is applying for a prov. order for electric lighting.

Neston.—The Heswall District Power Co., Ltd., has informed the R.D.C. that it intends applying for a prov. order for E.L. in the parishes of Heswall, Leighton, Hinderton, Parkgate, and Neston.

New Romney (Kent).—Messrs. Foote & Milne have notified the T.C. of their intention to apply for a prov. order for electric lighting.

Otley.—A syndicate is applying to the B. of T. for a prov. order for electric lighting, and the U.D.C. has decided to remain neutral in the matter.

Paignton (Devon).—A company has been formed here to carry on an electric light undertaking, with Mr. W. J. Ham, C.C., as chairman, and Mr. J. R. Mill as secretary.

Pontypridd.—At a special meeting of the Finance Committee of the U.D.C., the financial position of the electric light and tramways undertakings were considered, and it was resolved that no further expenditure be incurred, or any additional appointments be made in the departments until the manager (Mr. J. E. Teasdel) submits a report showing the undertakings in a better financial position.

Romford.—The United E.L. and Traction Co. has informed the U.D.C. that it intends applying for a prov. order for electric lighting.

Rugby.—The U.D.C. has applied for a loan of £1,500 for the provision of an additional 150-kw. generating set.

Stalybridge.—The Stalybridge, Hyde, Mossley and Dukinfield Tramways and Electricity Board has received from the L.G.B. sanction to a loan of £25,000 for electricity purposes.

Sunderland.—Having regard to the serious depression that has been experienced in the shipbuilding industry on the Wear, the annual report of the Corporation Electricity Department has been awaited with interest, and when presented at a meeting of the Town Council on the 8th inst., was the cause of some sharp criticism of the undertaking. The total units generated were 10,933,825, and of these there were sold 8,644,523 units, equal to 79 per cent., an increase of 1,067,006 units compared with the preceding year, the increase representing 14·1 per cent. The units sold were distributed thus:—Power, 4,344,854; ordinary lighting, 1,401,501; ordinary motors, 694,504; public lighting, 369,638; and for traction, 1,834,026. Although power consumers took 4,344,854 units, which was an increase of 1,130,650 units on the preceding year, yet six firms consumed 336,470 units less than in the preceding year. "The capital expenditure," the report continues, "again shows an increase, but the influence of the new capital has been good inasmuch as the expenditure per kilowatt installed has dropped from £51 to £42; this figure should continue to come down as the next generating plant extension will be a comparatively cheap one, as we now have buildings affording sufficient accommodation for a second turbine when required, and also a chimney shaft arranged for the corresponding boilers." The capital expenditure during the year was put down at £51,467, made up as follows:—Buildings and land, £10,305; machinery and accumulators, £30,316; mains, services, &c., £10,556; meters, instruments, &c., £177; incidentals, £113. Mr. Blackman reports substantial all round reductions in operating costs, and says the influence of the new turbo-generator has been very great. The abstract of accounts shows a gross revenue of £58,202 made up of £18,106 for private lighting; £23,605, power and heating; £12,895, tramways; and £2,031, public lighting; together with several other small items. The expenditure was £35,225, leaving a balance to be carried to the net revenue account of £22,977. Interest absorbed £11,831 and sinking fund £12,750, so that on the year's working there is a debit balance of £1,908; but against this special items of expenditure account for £1,144.

At the meeting of the T.C. on the 8th inst., Ald. John Turnbull said it was high time that the T.C. did something with regard to the electric lighting department. He moved that a special committee of the Council be elected, outside the Electricity Committee, with power to bring in anyone it might think desirable to advise it as to what was the best thing to do with the works at present. The Tramways Committee were paying something like £5,000 more for power than other towns in other parts of the country. He was of opinion that a saving of 3d. in the £ could be effected, provided if they were supplied from some public power company. He did not think that any man in that chamber should allow that state of things to go on. Mr. Robinson moved that the annual report be adjourned for consideration for a month, in order that Alderman Bruce, the chairman of the Committee, who was unfortunately absent through illness, might be given an opportunity of replying. This was agreed to.

Swansea.—The Corporation Electricity Committee has decided, in order to increase the demand for electrical energy to carry out installations at private houses on the hire-purchase system through contractors, the rate of interest charged being 7 per cent.

The T.C. has also decided to have the Oxford Street Market lit by electricity.

Swindon.—The T.C. has applied to the L.G.B. for a loan of £1,800 for extensions to the public arc lighting.

Wadebridge.—The U.D.C. has decided to sanction the application of Mr. G. L. Ellis, acting for a syndicate, for permission to use overhead wires in order to carry out an E.L. scheme. Energy will be supplied at 8d. per unit, and the Council is to have the option of purchasing the undertaking at stated intervals.

Walsall.—The T.C. has entered into an agreement to supply energy to the South Staffs. Tramways (Lessee) Co., Ltd., for working the tramways, at 1½d. per unit, less 10 per cent. discount, the annual minimum consumption to be 60,000 units. The T.C. is to bear the cost of laying cables, estimated at £800, and the price of electricity is to be subject to revision every three years.

Wolverhampton.—The annual report of the Electricity Committee of the Corporation has been issued. It shows that on the year's working a gross profit was made of £15,122, and a net profit of £3,325. Capital to the extent of £34,334 was expended during the year, the greater part of this expenditure being incurred in respect of the recent extensions to the main generating station at Commercial Road. These extensions were practically completed early in March last, but no revenue whatever was obtained from the new plant during the period covered by these accounts. The Committee states that the cost per unit of generation and distribution still remains at a

low figure, although during the past 12 months the cost of repairs and maintenance has been considerably increased. This is partly owing to the extensions carried out at Commercial Road, the cost of which has been charged to revenue. Moreover, in accordance with the dictates of the L.G.B., the wages of all permanent employés when engaged on capital work have to be charged to revenue account, and all meters and indicators are now purchased out of revenue owing to the refusal of the L.G.B. to grant a loan for a longer period than five years in respect of these articles. During the year ended March 31st, 1908, the total units generated at the destructor station were 957,329, representing a total revenue of £1,396 to the Team Department. The output of electrical energy for private consumers for lighting and motive power purposes has increased by 32 per cent., and even this rate of progress is being considerably exceeded during the current financial year. The total number of motors connected to the mains on March 31st last was 283, representing an aggregate of 2,135 B.H.P. This is an increase of 586 B.H.P. installed during the 12 months ending March 31st, 1908.

The town clerk has been empowered to prepare agreements to be submitted to the B. of T. for its approval, between the necessary parties in respect of the proposed supply of energy in bulk to the Midland Electric Corporation, Ltd., within its area at Bushbury. The Electricity Committee has approved a scheme recommended by the electrical engineer for public and private lighting on the Littenhall Road and adjoining area at a cost of £740.

United States.—ST. LOUIS.—A committee appointed to report upon the public lighting of St. Louis a year ago has now announced its conclusions. Municipal ownership is said to be inadvisable except as a last resource, the result being less efficiency and greater cost. Competition is also objected to, as being in the end more costly, increasing the damage to the pavements, and wasteful; reasonable rates should be fixed by the city, and payment should be based upon metered service. Contracts should be limited to short periods, to enable the city to reap the benefit of improvements in electric lighting, and efficient control over the supply company should be retained.

CHICAGO.—The city electrician, W. Carroll, in a report to the chairman of the Council Committee on Finance, gives the following table showing the "maximum electrical horse-power in the city of Chicago, May 26th, 1908":—

	E.H.P.
Commonwealth Edison Co.	211,720
Elevated and surface street railways, exclusive of current furnished by Commonwealth Edison Co....	93,532
Small electric light and power companies	13,041
Small isolated plants	79,275
City street lighting and isolated plants	7,000
Sanitary district	15,000

The same report estimates that the total water-power that will be available for development at Lockport on the Sanitary Canal will be 34,091 H.P. Deducting losses of 22 per cent. in the water-wheels, 5·5 per cent. in step-up transformers, 8·4 per cent in step-down transformers, 10 per cent. in distribution lines and feeders, and 9·8 per cent. in customers' transformers, 18,671 H.P. remains for distribution.—*Electrical World.*

Worthing.—The T.C. has received from the L.G.B. sanction to a loan of £810 for fitting incandescent lamps to arc lamp standards, £250 for meters, and £900 for additional condensing plant.

TRAMWAY and RAILWAY NOTES.

Birmingham.—An agitation is being carried on in Stechford with a view to linking up the district to the Bordesley Green tramways. The matter is being considered by the Birmingham and Yardley authorities.

Brentford.—A letter from the President of the B. of T. was read at the last meeting of the U.D.C. stating, with reference to complaints as to the condition of the London United tramway track, that Colonel Yorke would be sent to inspect the line. It was arranged that the chairman and other members of the Council and the surveyor should meet Colonel Yorke when the visit took place.

Cardiff.—The Tramways Committee has had under consideration the payment of 10 per cent. to the Public Works Committee on all work carried out by it in connection with the tramways. It was decided to appoint a special committee to go into the matter, as the engineer, Mr. Arthur Ellis, considered that the department would save by doing the work itself.

Chatham.—Last week, through the brakes failing to act, a tramway car in Middle Street, Old Brompton, ran away down a steep hill and collided with the Dockyard wall at the bottom; fortunately, no serious injuries resulted to those on the car.

Continental Notes.—GERMANY.—Plans are being prepared in respect of a projected electric tramway between Vohwinkel and Geresheim.

The Grand Duchy of Baden has decided upon an elaborate project of electric railway traction, the necessary power being obtained from waterfalls and rivers. Thus, out of 507,550 H.P. believed to be available, 261,820 would be obtained from the Rhine, 24,110 from the Neckar, and 221,620 from the rivers and torrents of the Black Forest. A third of this force is directly obtainable, and as the railways of the Grend Duchy can be worked by 32,000 H.P., sufficient power is left to light by electricity all the towns of 3,000 inhabitants and over. The first application of the principle will be made in the valley of the Weise.

HOLLAND.—The municipal authorities of Amsterdam have lately put in service a Krieger electrical motor ambulance.

Dundee.—The report of the deputation which recently visited the Continent to inspect trolley 'bus systems, has been made public. It is recommended that the Clepington Road should be equipped without delay and a circular route formed. The tramway manager has designed a type of vehicle for use in Dundee, and full details of the proposal are to be submitted to the B. of T.

Erith.—Negotiations are still proceeding between the U.D.C. and the Bexley U.D.C. with a view to effecting interrunning between the tramway systems of the two authorities. As the result of a conference, the Bexley Council offered to lease to the Erith Council, on certain terms, the Bexley tramway from a point in Market Place, Bexley Heath, to Northumberland Heath. The Erith Council, not being prepared to accept this offer, has submitted alternative terms to the Bexley authority. At the last meeting of Erith Council it was reported that the Highways Committee of the L.C.C. had informed a deputation upon the subject of the suggested junction between the L.C.C. tramways at Abbey Wood and the District Council's trams and the through running of the latter to Beresford Square, Woolwich, that it was not at present prepared to make any arrangement. However, it suggested that the deputation should further interview it in three months' time, and that in the meantime the tramway officers of the respective Councils should keep in touch.

Handsworth.—The District Council has fallen out with the Birmingham Tramways Co. over the negotiations as to the purchase by the company of the Villa Road tramways. The Council cannot agree to the Villa Road line being coupled up with the cable route.

Hull.—The returns of the Corporation tramways for the year ending in March last show that nearly 31 million passengers were carried, and some 3,022,844 car-miles run. The total revenue amounted to £129,837; working expenses to £74,192, and gross profit to £55,645. Financial and other charges absorbed £26,952; £20,000 was voted in relief of the borough rate, and £9,895 was carried to the reserve fund. Some 16 miles of route are in operation, and the department's own power station supplied 3,844,826 units out of the total of 3,865,051 units used for tramway purposes. The total operating cost per car-mile amounted to 7·84d., power expenses amounting to ·94d. The works cost of the tramways power station was approximately ¾d. per unit. The reserve fund now amounts to £87,043.

Liverpool.—On Saturday the B. of T. published the report of Mr. A. P. Trotter on a fire which broke out in a coach on the Liverpool-Southport Electric Railway on April 30th, soon after a train left Freshfield station on the down line. Mr. Trotter says the cause of the primary fire may be divided into two considerations:—(*a*) The defect, undoubtedly a short circuit, from a positive cable to "earth," that is, to the underframe of the carriage; and (*b*) the persistence of the electric current after it should have been automatically cut off. Consideration of the whole circumstances, he thinks, shows that while the use of materials not treated with non-inflammable composition, allowed the secondary fire to spread through the carriage, the most serious matter was the persistence of the electric supply. The exact nature of the defect which resulted in the short circuit was not ascertainable. He suggests that in constructing new rolling stock, greater care should be exercised in protecting the cables against the weather so that short circuits caused by water or snow may be avoided. Each section should have its own feeders, circuit-breakers, &c., in order to guard against a persistence of current, such as occurred in the accident under notice, when the current was supposed to have been automatically cut off.

London.—At a meeting of the L.C.C. on Tuesday an expenditure of £5,100 was sanctioned for the erection of a substation in Arlington Road, Camden Town. The station will be required in connection with the working of the tramways from Euston Road to Holloway Road, from Euston Road to Hampstead, King's Cross to Kentish Town Road, &c.

The Council postponed for a week the consideration of a proposal of the Highways Committee to expend £89,370 for the reconstruction on the conduit system of the tramways from Nine Elms Lane, *viâ* Wandsworth Road and Lavender Hill to Falcon Road.

The Highways Committee recalled the fact that the Council some time ago decided to enter into a contract with the G.B. Surface Contact Co. for the supply of magnet skate equipments for 48 cars to be used on the tramways from Aldgate to Bow. A sample equipment had since been delivered and experiments made with it showed that satisfactory results could not be secured with a single skate owing to the large size of the Council's cars and other circumstances. It would, therefore, be necessary to fit the cars with a double equipment. The company were prepared to supply the equipments for 12 cars at the rate of £137 per car, and the remainder at £125 per car, and the Committee recommended the acceptance of the offer

Nottingham.—The returns of the past year's working of the Corporation Tramways show that 31,411,860 passengers were carried, an increase on the previous year of 3,193,169. The

miles run were 3,299,283 and 5,294,979 units (or 1·63 per car-mile) were consumed. The total income for the year amounted to £153,743, and after deducting working and financial charges, a surplus of £22,357 remained. Of this sum, some £17,000 has been contributed to the general district rates, and £4,457 carried to the reserve fund, which now amounts to £59,813. The receipts of the extension through Sneinton to Trent Bridge *via* London Road, have fallen short of the total working expenditure, and this and other things have reduced the average receipts per car-mile from 12·30d. to 11·18d.; the average working expenses were, however, reduced from 7·28d. to 7·12d. during the same period.

Rhondda.—The Rhondda Valley Tramways Co., after overcoming many difficulties locally with different interested opponents, commenced a public service on Saturday, July 11th. Colonel Druitt, of the B. of T., accompanied by Mr. H. J. Nesbitt, chief engineer and manager, inspected the route, with Mr. R. P. Wilson, consulting engineer, and Mr. F. E. Stanley, representing the company. The Pontypridd electrical department has offered to give a "standby" or reserve supply to the Rhondda directors in case of emergency.

Richmond.—Sir Clifton Robinson has informed the T.C. that unless consent is given to the adoption of the overhead trolley system, the Bill authorising the tramways in Kew Road and over Kew Bridge will be dropped. He intimated that in the light of recent experience the surface-contact system of traction was not one that the directors on the ground of public safety alone would be prepared to install along so important a route. The chairman of the Tramway Committee at last week's meeting of the T.C. referred to surface-contact systems, which were working satisfactorily in Lincoln, Wolverhampton and Hastings, and said he thought the Tramway Co. was playing with the Council. A long discussion ensued, but no motion was adopted.

Rossendale.—On the 10th inst. a deputation from the Rawtenstall Corporation met the officials of the Rossendale Valley Steam Tramways Co., in London, and completed the purchase of the tramways for the purpose of reconstruction and electrification. Messrs. Underwood Bros., of Dukinfield, Manchester, have obtained the contract for reconstructing the tramways in the borough, and the work will be commenced without delay.

Torquay.—The borough engineer formally reported at the meeting of the T.C. on Tuesday that M. Dolter, accompanied by the city engineer of Paris and others, paid a visit to Torquay on the 3rd inst., and went over all the tramway routes. A communication was received from Sir Clifton Robinson, asking to be furnished with an opinion as to the working of the electric surface-contact tramways in Torquay. The town clerk reported that, after consulting with the chairman of the Tramway Committee, he replied that the system was working satisfactorily, and was popular with the public, and that, when considering systems in 1902, the Council thought it decidedly superior to the overhead system.

Victoria.—The Hon. J. A. Boyd, a member of the Victorian Government, Australia (without portfolio), has been making a tour of inspection in the counties of Northumberland and Durham during the early part of the week, studying the electrical developments that have taken place with a view to the electrical equipment of the Melbourne suburban railways. These railways have a length of about 40 miles, and serve a population of 534,000. This extent is similar to the area served by the North-Eastern Railway's electrified lines, hence the appropriateness of the study of the English company's works. The Melbourne railways are the property of the State, and at present are worked by steam. Mr. Boyd visited several generating stations in the county of Durham, and made a tour of the North-Eastern Railway's electrified section. Mr. Boyd left Newcastle on Monday evening for Glasgow, there to inspect the city tramways. He will then visit America and inspect the electrical installation at Niagara Falls.

TELEGRAPH and TELEPHONE NOTES.

Alpine Telephones.—The various Alpine shelters are to be connected with neighbouring towns by telephone, for the benefit of tourists obliged to take refuge therein.

Belgium.—The system of telephone lines increased from 136,218 km. of wire in 1905 to 154,477 in 1906, an increase of 18,259 km. There were 182 exchanges, an increase of 20 over the previous year, while the number of subscribers increased to 26,071, being in excess of the number of 1905 by 2,779. The system dealt with 2,969,619 internal conversations, while 281,896 conversations took place with foreign countries. There were exchanged with Germany 64,404 conversations; with England, 12,301; with France, 154,488; with Holland, 46,709; with Luxemburg, 3,994. Receipts on account of the inland service totalled 1,036,544 fr., an increase over 1905 of 112,934 fr., while the receipts on account of the international service were 560,105 fr., an increase over 1905 of 67,221 fr. The total receipts amounted to 7,742,016 fr., an increase over 1305 of 844,466 fr.

British Indies.—During the year 1906-7 the telegraphic system has increased by 4,599 km. of line and 25,934 km. of wire, the whole system being represented by 108,186 km. of aerial line with 416,764 km. of wire and 628 km. of cable with 1,753 km. of conductors. The Government owns 85,821 km. of aerial line and 264,278 of wire, and also 495 km. of cable with 727 km. of conductors. The remainder of the cable system is owned by the railway companies, canals, and private systems. The railway companies rank next to the Government in the ownership of aerial line, of which they have 12,497 km. under their control, representing 131,017 km. of wire, but the Government is the actual owner of the greater part of the railway and canal systems of telegraphs, as they are only leased by the Government. During the year under review the Government constructed for its own account 17 new lines with a length of 1,248 km., representing 14,005 km. of line; 13 other sections were reconstructed as well. The systems belonging to the railways and canals were extended by 1,774 km. of line, and 3,993 km. of wire.

The number of telegraph offices open to the public was 6,994, as against 6,723 in 1906. The inland telegraphic correspondence numbered 10,199,487 telegrams, of which 891,145 were on Government service, while 9,248,492 were private and 59,850 Press telegrams. The International traffic totalled 1,185,679 messages, 15,859 being Government, 1,162,660 private and 7,160 Press telegrams. This makes the total telegraphic business 11,385,166 telegrams. This figure represents an increase of 924,050, or 8·83 per cent. over the previous year's record. Of this increase the inland service claimed 811,665 telegrams, or 9·55 per cent., and the International service 78,949 telegrams, or 7·23 per cent. The receipts were 12,074,196 fr. on account of the inland, and 3,725,525 fr. on account of the International service. The former shows an increase of 569,483, and the latter a decrease of 118,706 fr., leaving a net increase of 450,777 fr. The decrease in the receipts for International traffic is due to a reduction of rates. The total revenue for the year amounted to 20,880,883 fr., and the expenses to 16,040,702 fr., showing a surplus of 4,840,181 fr. This represents a return of 2·95 per cent. on the capital outlay, which was increased in 1907 by 9,443,358 fr. to 163,935,540 fr.

Telephones.—Receipts from subscribers increased by 55,887 fr. to 442,445 fr. The Simla installation continues to grow, and at this place and at Calcutta it has been decided to erect central exchanges.—*Journal Télégraphique.*

New Zealand.—Amended regulations governing the use of public telephones throughout the Dominion have been gazetted, as follows:—For a distance up to 25 miles, 3d. (non-subscribers 6d.); up to 50 miles, 6d.; up to 75 miles, 9d.; up to 100 miles, 1s.; up to 140 miles, 1s. 6d.; up to 180 miles, 2s.; and for every succeeding 40 miles or less, 6d. The charges for long-distance conversations are as follows:—During the ordinary hours of attendance, 2s. 6d. for each period of six minutes; at other times, 5s.

Telegraphic Interruptions and Repairs:—

Cables.		Interrupted.	Repaired.
Curacao-Coro Curacao-La Guayra Curacao-Maracaibo	Closed	Jan. 12, 1906 ..	..
Tarifa-Tangier		Jan. 18, 1904 ..	..
Port Arthur-China (Closed)		Mar. 9, 1904 ..	..
Las Palmas—Arrecife		May 18, 1908 ..	..
Cayenne-Salinas		May 9, 1908 ..	..
Pera-Dardanelles		May 20, 1908 ..	..
erra Leone-Accra		May 28, 1908 ..	..
Cadiz-Tangier		June 8, 1908 ..	..
Kwandang-Menado		July 9, 1908 ..	..

Wireless Telegraphy.—Wireless telegraphic communication was opened on the 9th inst. between Lima and Iquitos, the great port at the head of the Amazon River, in Peru.

The Government of New Zealand has decided not to allow any private body to own the rights for wireless telegraphy in that colony, but to purchase the rights for itself.

CONTRACTS OPEN and CLOSED.

OPEN.

Australia.—Adelaide.—August 26th. The Postmaster-General requires tenders for 9 tons hard-drawn copper wire, 200 lb. per mile; specification No. 3; 3,000 copper tapes for 200-lb. wire, and No. 5 insulators, as per specification No. 195, to be packed in bundles of 100 each; 3,000 copper binders for 200-lb. wire and No. 5 insulators, as per specification No. 195, to be packed in bundles of 100 each; and 3,000 No. 5 insulators. Specifications may be inspected at the Electrical Review office.

Brisbane.—August 24th. The Postmaster-General requires tenders for iron, copper and covered wires, as per schedule 55, insulators, as per schedule 54, and ironwork, as per schedule 53.

Belgium.—August 11th. The municipal authorities of Louvain are inviting tenders for the concession for the supply of electrical energy for public and private lighting and power purposes in the town. Full particulars can be obtained from Le Directeur de l'Usine de Paz, while tenders are to be sent to Le Collège des Bourgmestre et Echevins de la Ville de Louvain.

Brussels.—The Société des Chemins de fer Vicinaux, 14, Rue de la Science, requires tenders for the supply and laying of under-

ground cables and return rails on the Namur suburban electric lines. Details are available by application to the Directeur-General at the above address.

Brussels.—July 27th. The Forest-les Bruxelles bourgmestre invites tenders for installations of apparatus, fittings and wiring, &c., for the electric lighting of the Pont-de-Luttre Schools.

Bulgaria.—July 20th. The Bulgarian State Department of Mines is inviting tenders for the installation of an electric lighting and power plant in the State coal-mines at Pernik.

Devonport.—General stores for the Corporation Electricity Department. Borough Electrical Engineer.

Eccles.—July 25th. Electric light installation at the new Clarendon Road Council school, for the Education Committee. Specifications, &c., from Mr. Henry Lord, architect, 42, Deansgate, Manchester.

France.—Chatellerault.—July 29th. A large supply of cable and electric wire is required by the war department. Particulars may be obtained at the Direction des Forges, 2, Avenue de Sise, Paris.

Paris.—The Under-Secretary for Posts and Telegraphs, 103, Rue de Grenelle, requires tenders for 12 lots of copper and bronze wire by July 31st; for iron and copper brackets, &c., by July 29th; for 14 lots of steel accessories, by July 25th; and for 1,250,000 insulators, by August 1st.

Germany.—The municipal authorities of Belzig (Saxony) are about to invite tenders for the establishment of a central electric lighting station in the town.

Gillingham.—July 17th. E.L. installation for schools for the Education Committee. See "Official Notices" July 3rd.

Hull.—July 27th. One 900-kw. d.c. generator and Belliss engine for the Corporation tramway power stations. See "Official Notices" to-day.

Ilford.—July 20th. The Education Committee invites tenders for the following works at Uphall School, Ilford, viz.:—Electric light wiring and fittings for about 200 lamps of 16 c.p. Mr. C. J. Dawson, F.R.I.B.A., 11, Cranbrook Road, Ilford.

Ipswich.—July 22nd. Rubber-insulated wires, paper-insulated cables, and copper trolley wire for the Corporation. See "Official Notices" July 10th.

London.—July 21st. Six electrically-propelled stores transport vehicles for the L.C.C. Tramways Department. See "Official Notices" July 3rd.

Manchester.—Electric wiring of the Electrical Exhibition Buildings. Only contractors who are exhibitors can tender. See "Official Notices" July 10th.

Portsmouth.—July 20th. Coal for the Tramways Committee. See "Official Notices" July 10th.

Radcliffe.—The Hanxley Parish Council invites provisional offers for providing and establishing 21 electric street lamps with aerial wiring, ready for receiving the current. Apply W. Gibson, Clerk, 94, Queen Street, Amble.

Rainhill.—July 23rd. Electrically-driven plunger pump for the County Asylum. See "Official Notices" July 10th.

Russia.—September 14th. The Town Clerk of Odessa (Upiawa) will receive tenders for a concession to erect and work a power and lighting supply. A central station of a minimum of 6,000 h.p. is to be erected and equipped.

Sierra Leone.—August 22nd. The Municipal Corporation of Freetown invites tenders for the lighting of the municipal buildings and streets by arc and incandescent lamps. Tenderers to quote price per 1,000 units. The exclusive right to supply electricity for private lighting for a period of at least 30 years will be granted to the successful tenderer. The right to install electric tramways may also be acquired. Tenders to Town Clerk, Freetown. Some further information may be seen at the office of Wilkinson & Broadbent, 4, Queen Street Place, E.C.

Spain.—July 28th. The Spanish Post and Telegraph authorities in Madrid are inviting tenders for the supply of 8,000 metres of telephone cable. Tenders are to be sent to La Direccion General de Correos y Telegrafos, Carretas 10, Madrid, whence particulars may be obtained.

York.—July 27th. Carbon brushes, carbons, meters, motors, lamps, &c., for the Electricity Committee. See "Official Notices" to-day.

CLOSED.

Australia.—Perth.—Postmaster-General's Department (for Commonwealth). 500 dry cells, 3s. each, Splatt, Wall & Co., Perth; 1,996 four-way conduits, 4s. 9d. each; 4,628 six-way conduits, 6s. 8d. each, Mills & Co., Perth.

Cottesloe (W.A.).—The D.P. Battery Co., Ltd., have received an order for the renewal of the central-station battery of 120 cells of their W.L. 9 type.

Ashton-under-Lyne.—The T.C. has accepted the tender of the British Insulated and Helsby Cables, Ltd., for the supply of 1,000 yards of pilot cables.

Crawley.—The Sussex Electricity Co. has accepted the tender of the D.P. Battery Co., Ltd., for the supply and erection of a storage battery.

Devonport.—The T.C. Electric Power Committee has accepted the tenders of Messrs. Clarke & Clarke for a cargo of Digby smalls at 10s. 9½d. per ton, and of Mr. G. F. Treleaven for a cargo of Aubank small coal at 9s. 11d. per ton.

Dundee.—Messrs. Lowden Bros. have received the contract in connection with the electric lighting of the new Engineering Laboratory at Dundee.

Felixstowe.—The Felixstowe and Dalston U.D.C. has placed with the D.P. Battery Co., Ltd., of Bakewell, a contract for 110 cells for a storage battery.

Germany.—The Allgemeine Electricitäts Gesellschaft, Berlin, has obtained the contract for the construction and equipment of the electric tramways in Baden-Baden.

London.—Hornsey.—The B.C. has accepted the tender of Messrs. Herbert Clarke, Ltd., for the supply of wharf slack for the electricity department; that of Messrs. Charrington, Sells, Dale & Co. for hard steam coal (Ibstock); and the tender of Messrs. Rickett, Smith & Co. for anthracite peas (Aberpergwym).

The Highways Committee of the L.C.C. has considered the following tenders for the supply of (1) high and low-tension switchgear for the second portion of the Greenwich generating station, and (2) of coal for this station:—

High and Low-Tension Switchgear.

Spagnolotti, Ltd. .. .. (recommended)	£2,212
Whipp & Bourne	2,349
Johnson & Phillips	2,403
Electric Construction Co.	2,646
British Westinghouse Co.	2,864
A. Reyrolle & Co.	3,700

Coal Supply for Year Ending with July, 1909.

	Tonnage offered.	Price per ton. s.	d.
Wm. Cory & Son .. .. .. (recommended)	100,000	11	0
G. Owen & Co.	100,000	11	1½
J. & M. Gunn & Co.	40,000 to 50,000	11	6
J. Hudson & Co. (London), Ltd.	100,000	11	8
Myers, Rose & Co.	50,000	11	7
	20,000	12	3
Dinham, Fawcus & Co.	10,000	11	9
A. Blackmore & Co.	10,000	11	9
	25,000	12	3
Harris, Hardman & Co.	50,000	11	6
	50,000	12	10
Rickett, Cockerell & Co.	30,000	12	10
Cleeves & Co.	30,000	12	11
S. Einstein & Co.	100,000	13	6
Lindsay, Blee & Co.	1,000 to 1,500 per month.	13	6
Charrington, Sells, Dale & Co.	12,000	13	4
	12,000	14	2
J. Fenwick (not to specification)	—	14	3

The tender of the Standard Engineering Co, amounting to £1,474, is to be accepted for the heating and ventilating of the central car repair depôt. Davidson & Co. also tendered, at £1,447, Musgrave & Co. at £2,158, and J. Keith & Blackman Co. at £2,524.

The Highways Committee proposes to make arrangements with Hadfield's Steam Foundry Co. for the supply of the special trackwork for the tramways from Nine Elms Lane to East Hill, Wandsworth, the expenditure being estimated at £9,000.

Poplar.—On July 9th the B.C. considered tenders for an additional water-tube boiler at the electricity works, the following being the amended particulars:—

Stirling Boiler Co., Ltd. .. .. (accepted)	£2,225		
Clarke, Chapman & Co., Ltd. ..	£2,573	Babcock & Wilcox, Ltd. ..	£2,750
Turner Bros.	2,605	Davis	2,100

The Electricity Committee reported that it had carefully gone into the qualities of several types of boiler, and directed an exhaustive comparative test to be made of the boilers already installed by the Stirling Boiler Co. and Messrs. Clarke, Chapman and Co. at the works. The results of the test had been submitted to it, and in the whole circumstances it had decided that the tender of the Stirling Boiler Co. should be accepted.

Stepney.—The B.C. on Wednesday had before it recommendations to accept a number of electrical tenders as follows:—

Reason Manufacturing Co., Ltd.—Meters up to 10 amperes capacity (£170); and demand indicators (£359 11s.).
Ferranti, Ltd.—Meters up to 10 amperes capacity (£328 10s.).
Sloan Electrical Co., Ltd.—Carbons (£767).
Venner & Co.—Time switches, £303.
Gilbert Arc Lamp Co., Ltd.—73 "Magazine" flame lamps, at £3 10s. each.
Universal Electrical Manufacturing Co.—70 switches and cut-outs, at £1 3s. 3d. each.

Maidenhead.—The U.D.C. has accepted the tender of Callender's Cable and Construction Co., Ltd., for the supply of cable, at £471.

Malvern.—The U.D.C. has accepted the tender of the Electrical Construction Co., Ltd., for a 50-kw. alternator with Bellis engine.

(*Continued on page* 103.)

ELECTRICITY SUPPLY IN SUTTON (SURREY).

The Undertaking of the South Metropolitan Electric Tramways and Light Co., Ltd.

The township of Sutton, which, together with Carshalton, Wallington and Cheam, constitutes this company's electric supply area, lies due west of Croydon and just outside the south-western boundary of the County of London.

Although at present an isolated area possessing many rural features, its close proximity to Greater London hardly leaves any doubt as to its ultimate rapid development as a residential neighbourhood—if, indeed, that development has not already begun—and in such circumstances the company has every reason to be satisfied with the future utility of both its electric supply and tramway ventures in the district.

Originally registered as the County of Surrey Electrical Power Distribution Co., Ltd., in April, 1899, the name of the undertaking was changed to its present one in August, 1904. Electric lighting orders were obtained for the places above mentioned, that for Sutton being transferred from the local authority.

Further, the company acquired several tramway orders, and under the powers obtained, constructed in 1906, lines between Croydon and Sutton, Croydon and Tooting, and on the other side of Croydon in Penge.

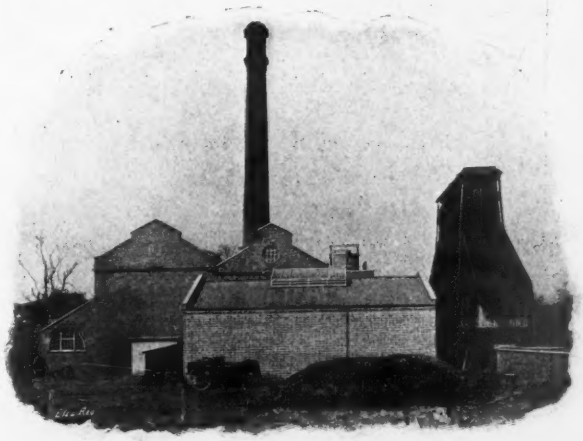


Fig. 1.—The Company's Sutton Generating Station

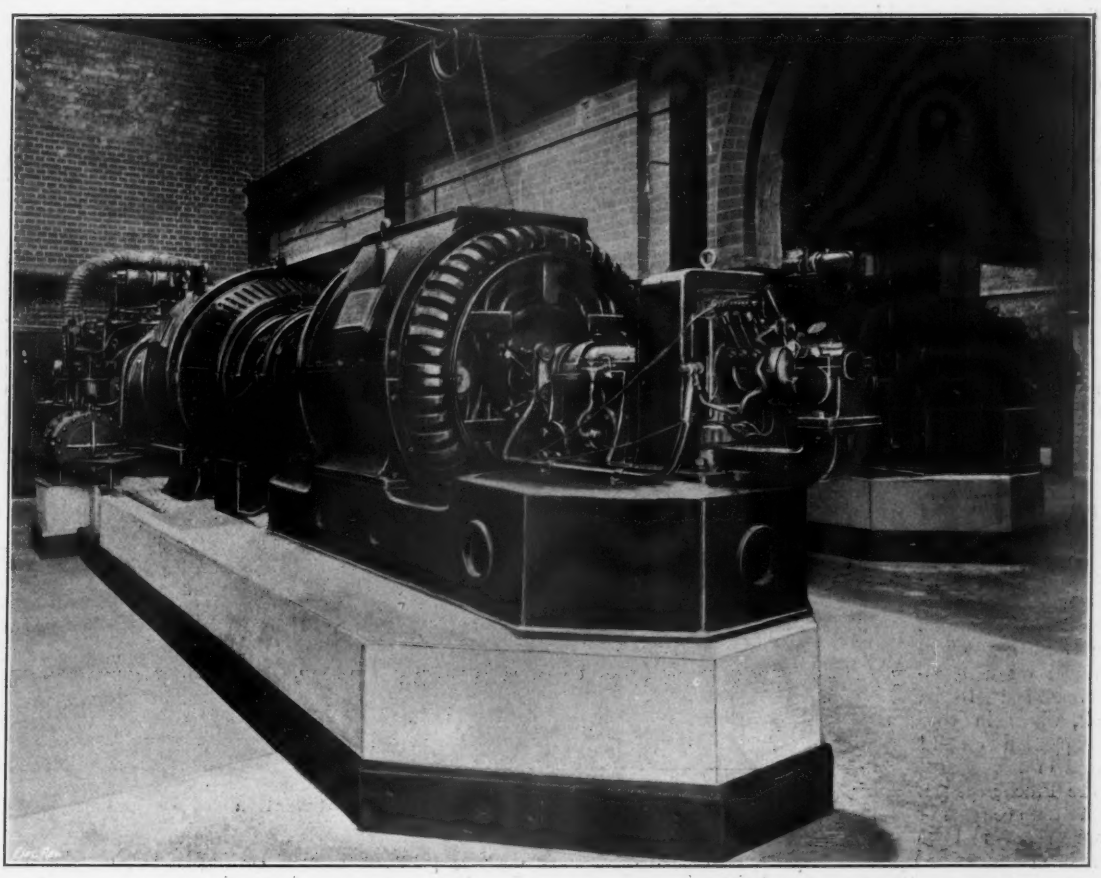


Fig. 2.—Parsons 500-kw. D.C.-A.C. Turbo-Unit, recently installed for Tramways and Lighting Supply.

The generating station of the company, which is situated adjacent to the Sutton Railway Station and almost in the centre of the area, is a brick building containing boiler, engine, pump rooms, &c. Its original equipment of Brush Universal engines coupled to alternators gave rise to such trouble with surrounding householders through vibration and noise, that ultimately the company decided on the adoption of turbine-driven plant as the best solution of a difficult problem. How difficult the solution of this question proved can best be gathered from a visit to the

plant, which, it must be remembered, stands on the solid chalk, as also does the private property some 100 yards away.

As a temporary expedient, a trench about 30 ft. in depth was dug out round the edge of the company's land abutting on the private property, but without appreciable result.

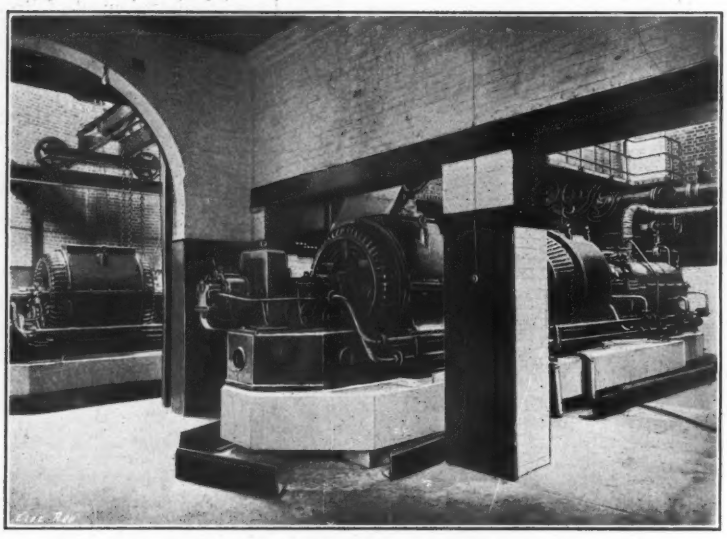


Fig. 3.—View Showing the Arrangement of the Ferro-Concrete Turbine Foundation, supported on Rubber Pads.

The new generating plant—which, we may remark, has given great satisfaction—consists of three turbine units, two being of Messrs. Parsons's most recent type, consisting of a 500-KW. turbine coupled in each case to a 250-KW. direct-current generator and a 250-KW. alternator arranged in tandem, and the other a 500-KW. Brush machine driving an alternator only.

All the turbine-driven machines run at 3,000 R.P.M., the alternators generating 50-period single-phase current at 2,000-2,200 volts, and the D.C. generators, which are intended for tramway work, supplying at 550 volts pressure. As will be seen from our views, the turbine units are each provided with an exciter coupled on to the extreme end of the shaft.

Special interest attaches to the foundations of these sets, they being each mounted on a ferro-concrete bed 18 in. thick, which in turn is supported on 14 groups of rubber pads on the Prache system. Each group consists of seven pads, and is carried in a circular cast-iron tray mounted on a concrete pillar, which forms the fixed foundation. The arrangement can be clearly seen in fig. 3; we understand from Mr. C. W. Durnford, the late engineer to the company, who, we are informed, has been appointed engineer and manager of the tramways at Devonport since this article was compiled, and who suggested its employment, that it has proved perfectly satisfactory in damping down the vibrations.

The Parsons units have shown a steam consumption of 20 lb. per KW. on full load, rising to 24 lb. at half load, using superheated steam and exhausting into a 26-27 in. vacuum, these consumptions being much less than were contracted for.

Two of the new sets are housed in a recently-built extension to the older engine room, and the latter, in addition to containing the third turbine unit, also houses the remainder of the old plant—viz., two alternators, of 300-KW. and 150-KW. capacity respectively, coupled to Universal engines, with speeds of 187 and 273 R.P.M. respectively. In connection with the new plant, a Brush surface condenser is installed in a pit in the extension engine room. The auxiliaries, including the three-throw air and centrifugal circulating pumps, are coupled to single-phase motors, and the plant is interconnected with an Allen steam-driven surface condensing plant (shown in fig. 6), which served the original steam engines, the exhaust being passed through a Holden & Brooke oil separator prior to entering the latter condenser. The steam-driven condensing plant and a steam-driven air compressor, used in connection with a deep well, are installed in an annexe to the boiler house; the well supplies all the water required for operating the station—viz., for the make-up for circulating and feed purposes.

The feed storage tank is situated over the boiler house, and is surmounted by a Mather & Platt water softener—the well water being very hard. In connection with the condensing plant, a wooden cooling tower, of the natural draught type, is provided, standing over a concrete tank.

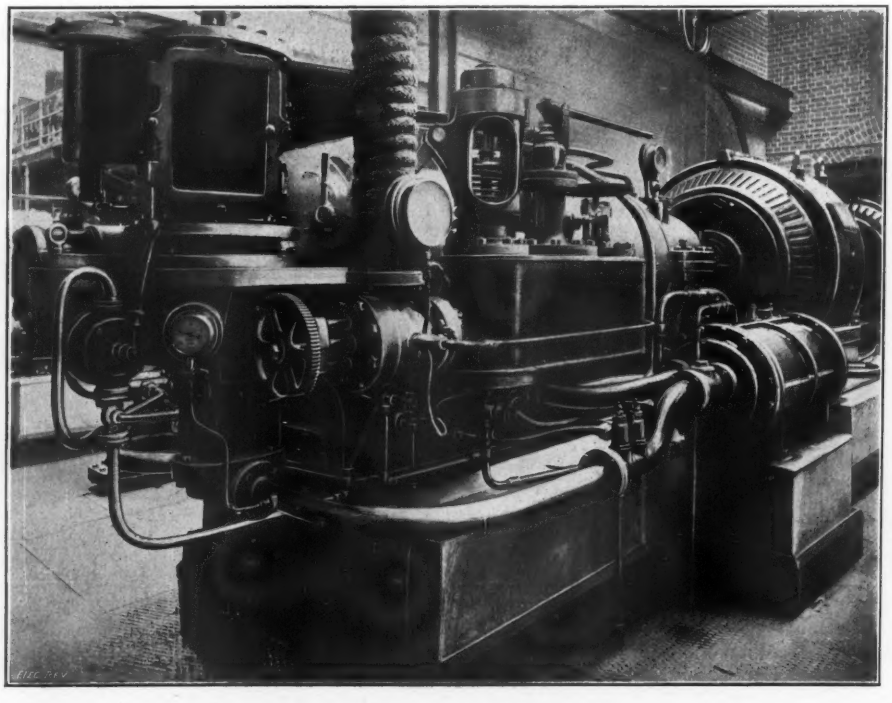


Fig. 4.—Steam End, Parsons Turbo-Generator.

The steam-raising plant, like that in the engine house, has recently been extended and modernised. Originally, three Babcock & Wilcox single-drum hand-fired boilers sufficed for the needs of the station, but recently two 30 ft. × 7 ft. 6 in. diameter Galloway boilers, fitted with superheaters, have

been added; Hotchkiss circulators are also provided, and a Nichol compound steam-driven vertical feed pump—all this new plant being installed in an extension built on to the original station structure.

The original boiler-house equipment also included a Worthington and two Weir feed pumps—the former utilised for forcing the hot-well water through a Cowans oil filter and

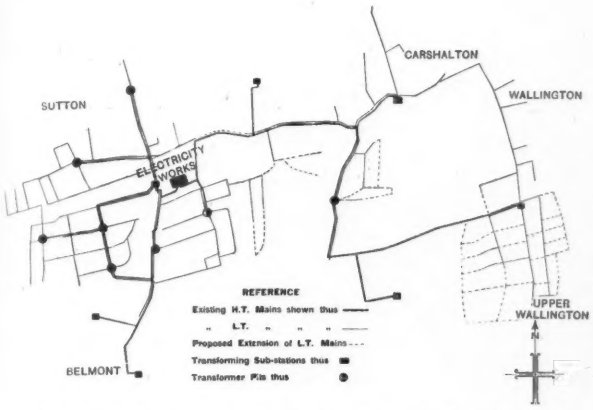


Fig. 5.—Plan showing the Lighting and Power Cable Network, etc.

Rankine filter in series, to the suction of the two latter pumps.

It is hardly necessary to say that smoke equally with vibration is a serious matter in a residential neighbourhood, and for this reason only selected Welsh coal is used in the boilers.

A switch gallery occupies one side of the old engine house, and carries six A.C. machines and 10 A.C. feeder panels of the Ferranti cellular pattern with oil switches. A Frahm frequency indicator and a recording voltmeter occupy a side

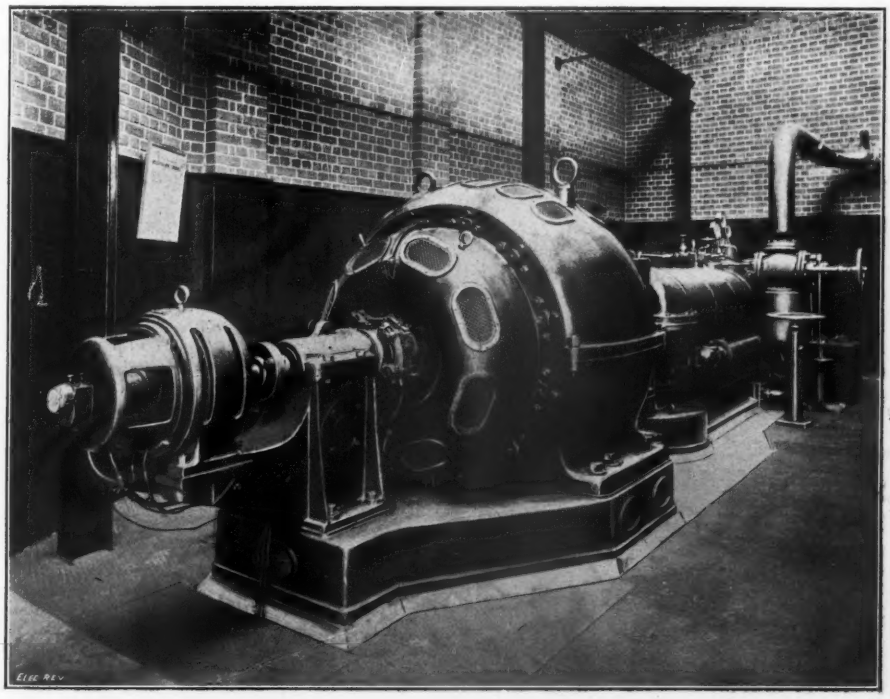


Fig. 7.—Brush 500-kw. Turbo-Alternator, Recently Installed.

panel; synchronising gear is fitted above the board, and the field resistances are placed below.

To the right of the above, a recently-added four-panel traction board is placed. This controls the two turbo-generators and one traction feeder, one panel containing the Board of Trade instruments together with a Raworth cut-out.

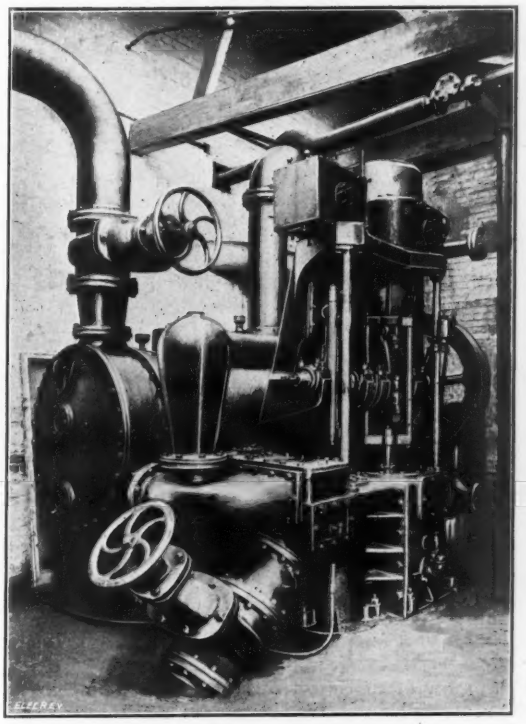


Fig. 6.—The Allen Steam-Driven Condensing Plant.

It is necessary here to explain that this station actually supplies only a short section of the South Metropolitan tramways lying in Sutton and Carshalton, and that the Raworth cut-out—a device not frequently met with on traction boards—is necessitated through the employment of regenerative control on some of the cars using this section.

Briefly, the cut-out comes into operation if the incoming regenerated current from the cars exceeds that being sent out by the station; its functions and arrangement were described in the Electrical Review of December 21st, 1906.

The principal distributing point in the area is the Mulgrave Road sub-station; between this and the generating station, H.T. concentric paper-insulated lead-covered feeders are drawn into ducts, and elsewhere similar feeders are laid solid in troughing.

For distributing purposes, concentric lead-covered and armoured cable is employed, laid direct, and for the tramways lead-covered paper-insulated cable drawn into ducts.

Altogether 17 miles of feeder and 35 miles of distributor cable are in use.

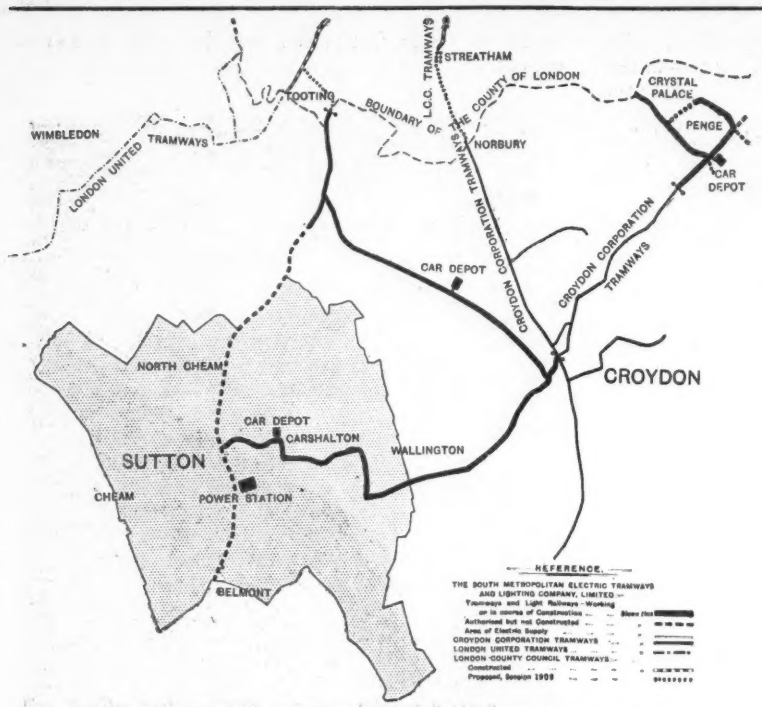


Fig. 8.—Diagram Showing the South Metropolitan and Adjoining Tramways.

Numerous transformer chambers and pits are situated at convenient points in the mains network, the Berry air-cooled transformer being employed throughout, for stepping-down the H.T. supply to distribution pressure.

At the end of last year some 603 consumers, with 31,100 equivalent-8-C.P. lamps, were being supplied, these including certain power consumers and the public street lighting in Sutton and neighbourhood.

For this latter purpose, in main thoroughfares, standards carrying four 30-C.P. Osram lamps, run two in series, are employed; side streets are similarly lighted, but only two lamps are fitted in each standard, and altogether 193 such lighting standards are in use.

As regards the tramways, some 13 miles of track are in use, the principal routes running through Croydon, Mitcham and Tooting, and Croydon, Wallington, Carshalton and Sutton.

A route authorised, but not yet constructed, will couple up the Sutton terminus of the existing line with the line running through Mitcham.

A 3-mile section of the company's route in Anerley and Penge, which was isolated when the Corporation took over the working of the routes in Croydon on the termination of the B.E.T. Co.'s lease in 1906, serves as an important connecting link between the Corporation routes and the Crystal Palace, its isolation having given rise to a mutual scheme of through running by means of which the company's cars still run into Croydon from Penge.

The routes practically all consist of double track, and are laid with 96-lb. rails, having Thermit welded joints for the most part. The overhead work includes both span-wire and bracket arm construction, the trolley wire being 3/0 size, grooved and fitted with mechanical ears.

Three car depôts are provided, one on each of the principal routes, and these house the 51 cars forming the rolling stock equipment of the undertaking.

The cars are of three principal patterns, mounted on bogie, radial and ordinary fixed trucks; half those operating on the Sutton section are fitted with the Raworth regenerative system of control, and all employed on the Penge section, which includes a well-known hill—grade 1 in 9—leading from the Crystal Palace into Penge, are fitted with Spencer track brakes. As previously mentioned, the company only supplies energy to some 3 miles of its own tramway undertaking, the remaining portions being supplied by the Croydon Corporation and Beckenham Council in their respective areas.

The company's undertakings, both electric supply and traction, are, of course, of comparatively recent origin, and occupying, as they do, a rapidly developing district, may reasonably be expected to attain a favourable position during the next few years.

In conclusion, we are indebted to the company, and more particularly to Mr. C. W. Durnford, the company's late chief engineer, for assistance in the preparation of this article.

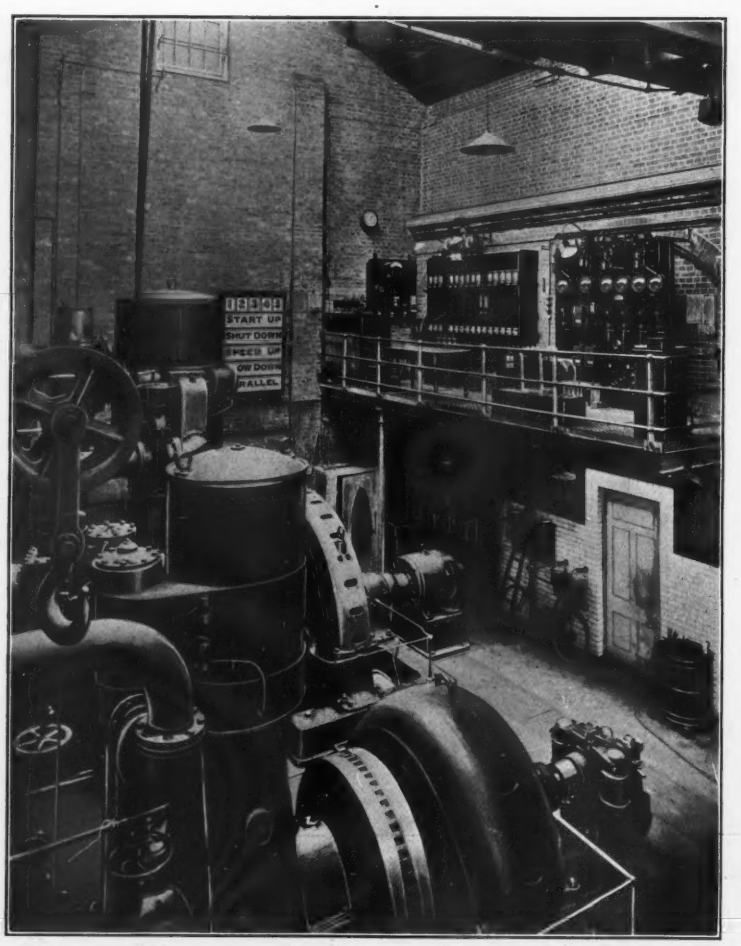


Fig. 9.—View Showing the Switchboards, &c., and Portions of the Original Plant, Sutton Generating Station.

Plymouth Electric Lighting.—The borough treasurer reported to the Finance Committee with reference to the electricity account, that the income for the last financial year was £24,610, and the working expenses £13,147, leaving a gross profit of £11,463. The gross profit was disposed of as follows: dividends and interest, £4,886; stock redemption, £4,444; amount transferred to the general district fund in aid of rates, £1,300. The balance of £833 was placed to the reserve fund, which now stands at £10,052.

CONTRACTS CLOSED.

(*Concluded from page* 98.)

Stalybridge.—The Stalybridge, Hyde, Mossley and Dukinfield Electricity and Tramways Board has accepted the tender of Messrs. J. P. Hall & Co. for the supply of feed pumps, and that of Messrs. Tangyes, Ltd., and the British Westinghouse Co. for motor-driven centrifugal pumps.

Walsall.—The Electricity Committee has accepted the tender of Messrs. T. Boston & Son, Ltd., of Birmingham, for supplying coal to the electricity department for one year.

Willesden.—The following is a list of tenders received by the District Council for converting plant:—

Crompton & Co., motor-generator	£713 0
Schorch, motor-generator	726 10
British Thomson-Houston Co., motor-generator	735 0
Electric Construction Co., motor-generator	750 0
British Westinghouse Co., rotary converter	(accepted) 786 0
General Electric Co., rotary converter	873 0
Siemens Bros. Dynamo Works, motor-generator	874 0
British Electric Plant Co., motor-generator	955 0
Bruce Peebles & Co., motor-converter	1,045 0
Mavor & Coulson, motor-generator	1,070 0
Johnson & Phillips, motor-generator	1,104 0

Whitehaven.—The Education Committee of the Cumberland C.C. has accepted the tender of Messrs. F. B. Hellon and Co., of Liverpool, for installing the electric light at Whitehaven Schools, at £284.

Woodbridge.—The D.P. Battery Co., Ltd., has secured the contract for the doubling of the storage battery installation of the Suffolk Electricity Co., Ltd.

Worthing.—Twenty-one tenders were received for the supply of 1,600 tons of coal at the electricity works during the ensuing year. The T.C. has accepted the tender of the Crynant Colliery Co., Ltd., for the supply of 800 tons of Welsh coal at 17s. 10d. per ton, and that of Messrs. Wm. Cory & Son for 800 tons of unscreened Holmside Durham coal at 18s. 9d.

CONTRACTORS' COLUMN.

[The following information is published in the interests of electrical contractors and others who are seeking for openings for new business. Considerable expense is incurred in the production of this column, and every care is taken to ensure that the information is new and accurate, but it will be understood that in a matter where so many correspondents are engaged, and where the amount of information to be handled is very large, this cannot always be guaranteed. If alleged inaccuracies are reported to the Editors, they will be fully investigated.]

ABERDEENSHIRE.—Additions and alterations on estate of Rothie. W. L. Duncan, architect, Turriff.

ABERLOUR.—New Roman Catholic Church.

ABERYSTWYTH.—School; D. Lewis, architect, Aberystwyth. House for Town Clerk; G. T. Bassett, architect, Aberystwyth.

ALNWICK.—Additions to house in Grey Croft for Major Scott.

ASHFORD.—House in Canterbury Road, C. Howland, builder; bungalow, in Eastern Avenue, for W. H. Louth.

BARNET.—Four houses in Fitzjohn Avenue. J. Farrer, architect, 23, Coleman Street, E.C.

BARNSLEY.—New premises for the Radical and Liberal Club. E. W. Dyson, architect, 10, Regent Street, Barnsley. Houses, Peel Street, for T. W. Woodcock; Blenheim Road, for Chas. Woodruff; new entrances, dressing rooms, refreshment bars, &c., for the Football Club. Proposed school (accommodation 900) in Grove Street, for the Barnsley Education Committee.

BARNSTAPLE.—Four houses, Carlyle Avenue, Yeo Vale Road, for J. O. Rice. Residence for Mr. Ridge, builder, The Strand, Barnstaple. (Will probably use electric light.)

BARROW-IN-FURNESS.—Ten houses, Flash Lane, T. Lee, builder; additions to house in Croslands Park, for Col. Strongitharm; public conveniences in Church Street, Nuchaldson Road, and Holker Street, for the Corporation; house in Ferry Road, for Vickers, Sons & Maxim, Barrow; pair of houses in Croslands Park, for F. W. Cookson; pair of houses in Croslands Park, for W. Ray.

BARRY (Glam.).—Police Station at Cadoxton, for the Glamorgan C.C. T. Mansel Franklen, clerk of the County Council, Council Offices, Westgate Street, Cardiff.

BECKENHAM.—Additions to "Highwood," Westmoreland Road, F. G. Crickett; three houses, Avenue Road, S. Stenning; five houses, Arrol Road, for H. Baldwin.

BEDFORD.—Girls' Modern School. Governors of the Harpur Trust.

BELFAST.—Additions to Municipal Technical Institute.

BIRKDALE (Lancs.).—Houses, Cardigan Road, for Mrs. Pickup; Cardigan Road, for S. W. Rimmer; Sandringham Road, Ainsdale, for Mrs. Robins; Mill Lane, for Mr. Gibson; additions to premises, Liverpool Road, for the Liberal Club.

BIRKENHEAD.—Schools for the T.C., Hemingford Street, to be lit by electricity. T. T. Rees, architect, Liverpool; Morrison & Son, builders, Wavertree.

Elementary Schools in Conway Street. Morrison & Son, builders, Wavertree, Liverpool.

BIRMINGHAM.—Church House at Acock's Green (£1,700). H. W. Hobbiss, architect, 33, Newhall Street, Birmingham.

BIRSTALL.—Sixteen houses for the Birstall Co-operative Society.

BLACKBURN.—Sessions house, police station, public hall, and new County Court and Government offices at Blakey Moor, for the T.C.

BLACKPOOL.—Mission Church at Revoe (£1,100); J. B. Thornley, architect, Blackpool. New Primitive Methodist Church, in Central Road; Trustees. New Swedenborgian Church, for Stanley Road Church.

BLETCHINGLEY (Surrey).—Alterations and additions to the Council Schools (£1,258). G. E. Everitt, builder, 79, Windmill Road, Croydon.

BOSTON.—Houses, Castle Street, for F. Davy; workshop, Wormgate, for W. H. Parker & Son; conversion of five houses into shops, West Street, for F. Bull; additions to malt-kilns, Bond Street, for Peacock & Co., Ltd.

BOURNEMOUTH.—Parish Hall, for Talbot & Wallis Down (£740). F. Ling, architect, Winton, Bournemouth.

BOWBURN (Co. Durham).—School for the Durham C.C. (450 scholars). H. T. Gradon, architect, Market Place, Durham.

BRADFORD.—Detached house at Great Horton; S. Spencer, architect, Old Bank Chambers, Great Horton, Bradford. New St. Laurence's Mission, Bolton Woods; H. E. Priestley, 17, Bertram Road, Manningham, Bradford.

BRECHIN.—Alterations to shop, for Mrs. Birse, clothier, Brechin.

BRENTFORD.—Additions to Isolation Hospital. J. W. Croxford, Borough Surveyor, Clifden House, Boston Road, Brentford.

BRIDLINGTON.—House and stable in Belgrave Road, for J. Hartley. M. B. Parkin, architect, Midway Avenue, Bridlington.

BRISTOL.—Extensions to Nos. 55 and 56, Castle Street, for Reynolds and Adams. La Trobe & Weston, architects, 44, Corn Street, Bristol.

BROMLEY.—Additions, &c., to motor-garage. W. E. Tapley, builder, 2, Wendover Road, Bromley.

BROWNHILLS (near Walsall).—Houses, Lichfield Road, Shire Oak, for Fredk. Bradbury; Lichfield Road, Sheffield, for A. Gibbs; Lichfield Road, Sandhills, for Geo. Craddock.

BRYNMAWR.—New Congregational Church, for the Bailey Street Congregation (£1,400).

BUCKHAVEN (Fife).—New Infectious Diseases Hospital. Town Clerk, Buckhaven, Fife.

BUCKIE.—Extension of Cluny Harbour (£80,000). W. T. Douglas, M.Inst.C.E., Westminster.

BURNLEY.—Assembly rooms and shops in Oxford Street, for the Fulledge Conservative Club. Secretary, Fulledge Conservative Club, Burnley.

BURY.—Seven houses in Ainsworth Road. Radcliffe & Pilkington Co-operative Society, Ltd., Sion Street, Radcliffe.

CAMBORNE.—New church, Trelowarren Street. Mitchell & Bond, builders.

CAMBRIDGE.—Examination rooms, Parson's Court, for the Chancellor of the University; 10 houses Stanley Road, for T. Buck, 22, Stanley Road; additions to Victoria Assembly Rooms, for the Rev. P. H. Mason, 6, Brookside.

CANNOCK.—Houses, Heath Hayes, for J. Vernon; offices, Cannock Foundry, for S. Jellyman.

CARDIFF.—Warehouses on site of old City Hall, St. Mary Street, for the Wholesale Co-operative Society, Ltd., Manchester.

CARLISLE.—Wesleyan school hall and vestries in Currock and Blackwell Roads.

CATERHAM HILL (Surrey).—Additions to schools for the C.C. (£2,994), and special subjects department at Little Roke Schools (£1,270). W. Wallis, builder, Ramsden Road, Balham, S.W.

CASTLE-DOUGLAS.—Telephone installation at new higher grade school, Kelton. J. Dunn, Clerk to the Kelton School Board, Castle-Douglas.

CHARLTON (Kent).—Enlargement of fire station. W. E. Riley, Superintendent Architect, L.C.C., Spring Gardens, S.W.

CHEADLE (Cheshire).—Houses, Stanley Road, Cheadle Hulme, for G. P. Hadfield; Grove Lane, for J. H. Clibran; heating and store rooms at Demming's Works.

CHELMSFORD.—New laundry and lodge and additions to Baddon Road Isolation Hospital, for the Joint Hospital Board. C. & W. H. Pertwee, architects, Chelmsford.

CLIFTON (near Manchester).—In last week's notice *re* developments at Newtown, it should have been Clifton & Kearsley Coal Co., not Kearsley Coal Co., as stated.

CLYDEBANK.—Congregational Church in Fifth Street, Radnor Park; temporary Roman Catholic Church in Duntocher Road (seat 1,000).

COCKERMOUTH.—Conversion of "Grecian Villa" (£5,000 residence) into infirmary, for the Board of Guardians.

COOKHAM.—Detached residences, Furze Platt, for P. M. Lever; Alwyn Road, for H. Vaisey, and for W. Oetzmann; bungalow residence, for W. Oetzmann.

CORK.—Rebuilding premises in Great George's and Brunswick Streets for T. Lyons & Co., Ltd. J. F. M'Mullen, architect, 30, South Mall, Cork.

COULSDON (Surrey).—Parish room for St. Andrews. S. Knight, architect, 12, Rossdale Road, Putney, S.W.

CREWE.—Sunday schools in connection with Trinity Wesleyan Church. W. G. Timperley, 243, Walthall Street, Crewe.

CROMPTON.—Houses, Chamber Road, for T. Milne; George Street, for J. E. Buckley; alteration to shops in Rochdale Road, for the Crompton Co-operative Society.

DARLINGTON.—Additions to premises in Priest Gate, for the Darlington Co-operative and Industrial Society, Ltd. Clark & Moscrop, architects, Feethams, Darlington.

DARTFORD.—Council school, Crayford, Northend. Architect, Kent Education Committee, 44, Bedford Row, W.C.

DERBY (Mickleover).—Primitive Methodist Church and schools. John Wills & Sons, architects, Derby; J. & J. Warner, builders, Mickleover.

DEVONPORT.—New school (accommodate 1,000). W. G. Crang, Secretary to Education Authority. Extensions to premises, Catherine Street, for J. B. Love, draper. Lethbridge & Sons, builders, Plymouth.

DROYLSDEN.—Extension to the sewage works for the District Council.

DUDLEY.—Extensions to the workhouse for the B.G. E. G. Coslett, architect, Dudley.

DUMFRIES.—Alterations and additions at Crichton Royal Institution. S. Mitchell & Wilson, architects, 13, Young Street, Edinburgh.

EASTBOURNE.—Repairs (after fire) at St. Peter's Church.

EAST GRINSTEAD.—Council school at Ashurst Wood (£3,840).

ELGIN.—Villa. E. C. Doig, architect, 174, High Street, Elgin.

ESTON-IN-CLEVELAND (Yorks.).—New Parish Hall (£1,400). J. Loftus, architect.

FAIRFIELD (near Buxton).—Houses, Tongue Lane, for Mr. Baines.

FOLKESTONE.—New Corporation schools, Chart Road, lit by electricity (£10,000). F. Newman, architect, 4, Bouverie Square, Folkestone; Hayward & Paramor, builders, London Road, Dover.

FRIERN BARNET.—Flats, Sutton Road. D. Dakers, builder, 56, Winchester Avenue, Hampstead, N.W. Institute, Mackintosh & Newman, architects, Birkbeck Bank Chambers, W.C.

Eight houses, Pollard Road, C. Dicks; two houses, Friern Road, J. Reynolds.

FRIMLEY (near Farnborough, Hants).—Proposed new Cottage Hospital.

FROME.—Improvements at Milk Street Council School; alterations to the Railway Hotel.

GILLINGHAM.—Houses, Rainham Road, for Mr. Obee; Rainham Road, for H. Brunning; Barnsole Road, for Driver & Fry; proposed new premises, Canterbury Street, for Mr. Thorn.

GLASGOW.—Church at corner of Upper Bridge and Queen Streets for the Alexandra Bridge Street U.F. Congregation (£5,000). Rev. W. Hamilton, pastor.

GOSPORT.—Proposed new Baptist Church (£3,690).

GRAVESEND.—Offices in King Street. Bridgland & Clay, architects, King Street, Gravesend.

HANLEY.—House, Eaton Street, for W. H. Johnson; house, Baskerville Road, for W. Sargeant.

HARLOW GREEN (Co. Durham).—School for the Durham C.C. (476 scholars). J. W. Roundthwaite, architect, 13, Mosley Street, Newcastle-on-Tyne.

HARPENDEN.—Farmhouse, Little Bamville, for H. C. Wright; additions to "Bamville," for S. Childs.

HEMEL HEMPSTEAD.—Houses, Marlowes, for E. G. Jackson; new road, for J. T. Vaughan-Hughes.

HESSLE (Yorks.).—Houses and villas in Trinity Grove, Marlborough Avenue, Davenport Avenue and Swanland Road.

HETTON-LE-HOLE (Co. Durham).—Houses, Four Lane Ends, for R. Lawson and Sons; Elemore Lane, for Mr. Stewart.

HEYWOOD.—New Mission Church for St. James' Parish.

HINCKLEY.—New Baths for the U.D.C. (£2,650); two houses at Earl Shilton, for J. Knight.

New Workhouse Infirmary (£6,220). Clerk to Guardians, Union Offices, Hinckley.

HOLCOMBE BROOK (Lancs.).—New boiler house at Redisher Bleach Works. Messrs. C. Ainsworth & Co., Ltd.

HYTHE.—New post office in High Street under consideration.

ILFRACOME.—New County Schools at Shepherd's Park (£4,000). R. Pickett, builder, Ilfracombe.

INVERESK (N.B.).—Alterations to Wallyford School. A. M. Hardie, architect, 20, George Street, Edinburgh.

KINCARDINE.—Restoration of farm steading at Hallhill, Kinneff. George Gregory, architect, Stonehaven.

KINGSTON-ON-THAMES.—Adaptation of "The Grove," Penrhyn Road, for office accommodation. R. Nares, secretary to Surrey Education Committee, Kingston.

KIRKCALDY.—Hall for Gallatown U.F. Church. Minister, Gallatown Church Manse.

LAMPETER.—School, Tymawr; J. Owen, builder, Lampeter. Police station at Drefach; J. Evans, builder, Llanylyther.

LANGPORT (Somerset).—Enlargement and improvement of the Board Room, for the Board of Guardians (£325).

LEITH.—Six-flatted villas and one self-contained villa in Lixmount Avenue for G. R. Black.

LIVERPOOL.—New St. Mary's Mission Hall in Northdale Road, Wavertree. H. L. Beckwith, 3, Cook Street, Liverpool.

Proposed new hotel in Lime Street, for Midland Railway Co.

LONDON (E.C.).—Additions, &c., to theatre, Guildhall School of Music. Architect to Music Committee, City Corporation.

(Muswell Hill, N.).—Two houses, Woodberry Crescent, Edmundson's, Ltd., Woodberry Crescent, Muswell Hill.

(Muswell Hill, N.).—Blocks of residential flats. Coleman and Holmes, architects, Archway Road, Highgate.

(Norwood, S.E.).—Factory, Somers Place, for the Trustees of the Stockwell Orphanage.

(Hammersmith, W.).—Addition to chapel at 127, Uxbridge Road for Rev. E. G. C. Parr.

(Whitechapel, E.).—Addition to 75, Whitechapel Road. W. G. Brown, builder, 190, Mile End Road, E.

(Hackney, N.E.).—Buildings, Stamford Hill, for Lady Wm. Cecil, 23, Queen's Gate Gardens, S.W.

(Hampstead, N.W.).—Church room. E. A. Pearce, care of Building Committee, St. Stephen's Church.

(Commercial Road, E.).—Building in Christian Street. Mark King & Son, surveyors, 6, Holborn Viaduct, E.C.

(Deptford, S.E.).—Sixteen houses, Avignon Road. F. J. Oldman, builder, 91, St. Asaph Road, S.E.

(Deptford, S.E.).—Thirty-two houses, Revelon Road. G. Simmonds & Sons, builders, 62, Erlanger Road, Deptford.

(Golder's Green, N.W.).—Church of England. F. W. Brodie, secretary, Golder's Green, N.W.

(Hackney, N.E.).—Addition to premises in Mare Street. J. Mowlem and Co., builders, 19, Grosvenor Road, Westminster.

(Hackney, N.E.).—Additions to London and Provincial Bank, Stamford Hill. T. Rider & Son, builders, West Chislehurst, Bromley.

(Lewisham, S.E.).—Additions to Parish Hall, Courtrai Road. J. Dorey & Co., Ltd., builders, Brentford.

(Stratford, E.).—Alterations, &c., 18, Broadway. Clemens Bros., builders, York Road, East Ham.

(Holborn, W.C.).—Adaptation of premises for trade classes (£5,460). T. J. Bailey, Education Architect, L.C.C., Spring Gardens, S.W.

(Lewisham, S.E.).—Buildings in Manor Lane. W. J. Scudamore and Sons, builders, 13, Manor Lane, S.E.

(Lewisham, S.E.).—Houses in Inchmerry Road. Norfolk & Prior, architects, Catford, S.E.

(Silvertown, E.).—Bottle-washing shed for Co-operative Wholesale Society, Ltd., Silvertown.

(Stratford, E.).—Alterations to "Swan" depôt for Aerated Candy Co., Ltd., Victoria Street, Stratford.

(Southgate, N.).—Additions to Colney Hatch Asylum (£450). W. E. Riley, Superintendent Architect, L.C.C., Spring Gardens, S.W.

(Vauxhall, S.W.).—Enlargement of fire station. W. E. Riley, Superintendent Architect, L.C.C., Spring Gardens, S.W.

(Streatham, S.W.).—Two shops and telephone exchange. Bromley and Watkins, architects, 6, South Square, Gray's Inn, W.C.

(Stepney, E.).—Adaptation of Trafalgar Square School. T. J. Bailey, Education architect, L.C.C., Spring Gardens, S.W.

LOUGHBOROUGH.—New Vestries and extension of chancel accommodation at Emmanuel Church. Rev. R. H. Fuller, Rector.

LUTON.—Proposed new Catholic Church.

LYTHAM.—New Institute and Public Hall at Ansdell. G. H. Willoughby, architect, Parr's Bank Chambers, Manchester.

MAIDENHEAD.—Workshop, Grenfell Road, for T. Free & Sons, Ltd.; workshop and stables, York Road, for T. S. Vevors.

MAIDSTONE.—Rebuilding of business premises, Week Street, for M. Jacobs, house furnisher.

MANCHESTER.—Proposed new Baptist Church at Moss Side (£2,000). Rev. A. Streuli, pastor. Plumber's workshop at Monsall Hospital; City Architect, Town Hall, Manchester. Warehouses and offices in Fennell Street, in connection with the Corporation Improvement.

MARPLE.—Motor house for G. T. Buckley, Field House; New Girls' Institute.

MARSKE-BY-THE-SEA.—New Sunday School, and alterations to the Wesleyan Church. D. M. Spence, architect, Shotley Bridge, Co. Durham.

MERTHYR TYDFIL.—Houses, Lower High Street, Dowlais, for M. M. Morgans; Dixon Street, for G. Cleary; Cwm-Nant-y-Coed, for Nathaniel Moss.

MIDHURST.—Improvements at the Grammar School. West Sussex Education Committee.

MONMOUTHSHIRE.—Secondary schools at Eastern, Western and Rhymney Valleys under consideration for the Monmouthshire Education Committee. Clerk to the Committee, Education Offices, Newport, Mon.

NEW MILLS (Derbyshire).—Probable rebuilding (after fire) of the works of J. & E. Dalton & Co., Ltd., emery cloth manufacturers.

NEWPORT (Mon.).—Houses, St. Julian's Estate, Caerleon Road, Magor, for Chas. West.

NEWQUAY.—New county school for local education authority. B. C. Andrew, architect, St. Austell.

NEWTON ABBOT.—Extension of the joint hospital. S. Segar, architect, Union Street, Newton Abbot.

NORTHALLERTON.—Church at East Cowton. Woolfall & Eccles, architects, 60, Castle Street, Liverpool.

NORTHWICH (Cheshire).—Rebuilding and extension of premises for Wm. Shield, pawnbroker, Witton Street.

OLDHAM.—Extension to the wash-house and laundry at the workhouse. C. T. Taylor, architect, 10, Clegg Street, Oldham.

ORMSKIRK.—Four houses in Queen Street for A. W. Wiggins.

OSWALDTWISTLE.—Houses, Margaret Street, for Anthony Woodworth.

PAUL (near Penzance).—Block of buildings, Bucca's Pass, for R. R. Bath; eight houses, Thos. Tonkin, builder, Newlyn.

PENRHIWCEIBER.—Constitutional Club. F. Miller, architect, Mountain Ash.

PETERSHAM (Surrey).—Dairy and store, Manor Farm. C. E. Sims, builder, Ham Common.

PLYMOUTH.—Timber sheds, R. and R. Bayley, timber merchants, Cattedown, Plymouth; 13 houses, E. E. Endicott, builder, Holland Road, Penerell, Plymouth; addition to offices, I. Foot, jun., 21, Lockyer Street, Plymouth; house, H. J. Palmer, Colebourg Buildings, Plymouth; additions to houses, C. W. H. Fox, 11, Lockyer Street, Plymouth; six houses, Mr. Danverell, builder, Honudiscombe Estate, Plymouth; house, D. Ward; shops, Ebenezer Chapel Trustees, Saltash Street; conversion house to shop, E. J. Jarvis, 4, Silentley Plain; warehouse extensions, Britannia Clothing Co., Kinterbury Street.

PONTYPRIDD.—School for the U.D.C. Education Committee (750 scholars). P. R. A. Willoughby, surveyor to the Council, Municipal Buildings, Pontypridd.

PRESTWICH (near Manchester).—Proposed refuse destructor for the District Council.

RICHMOND.—Extensions to Town Hall, for Richmond Town Council. Alterations to Richmond Theatre; B. Crewe, architect, 75, Shaftesbury Avenue, W.C.

RICKMANSWORTH.—New schools at Mill End for Herts C.C. U. A. Smith, county surveyor, Hatfield.

RINGWOOD (Hants.).—New post-office. Barrow Bros., builders, Ringwood.

ROCHDALE.—Church Army headquarters, in Water Street; Sykes & Evans, architects, Rochdale. Extension to Wicken Hall Printworks, Milnrow.

ROCHESTER.—Residence, King's Avenue, St. Margaret, for E. B. Wood.

ROTHERHAM.—Municipal High School for Girls (accommodate 300); S. Hey, Clerk of the Governors, Education Offices, Town Hall, Rotherham. New church at Whinney Hill, Thrybergh.

ROTHWELL.—Extension of Gladstone Street School.

ROYSTON (Yorks.).—Houses, Midland Road, for Geo. White; Godley Street, for Kaye & Hughes.

RUGBY.—Church in St. Peter's Road. Rev. A. V. Bailie, pastor.

RUSTINGTON (Sussex).—Entrance lodge at Millfield. W. T. Hatch, engineer-in-chief, Metropolitan Asylums Board, Victoria Embankment, E.C.

RYHOPE (Co. Durham).—48 workmen's dwellings for the Sunderland R.D.C. J. Spain, architect, 12, John Street, Sunderland.

ST. ALBANS.—Houses, Hatfield Road, for Miss Hill; York Road, for W. A. Gooding; Blenheim Road, for Mrs. A. M. Phillips; Cambridge Road, for F. Toogood.

ST. ANNES-ON-THE-SEA (Lancs.).—Enlargement of technical school; detached villas for W. A. Crawshaw and A. Patterson, Mrs. A. A. Hamer and Miss F. Watson. Houses, Clifton Street and St. Alban's Road, for Madame A. Hopwood; St. Andrew's Road, South, for J. Shepherd & Sons; Bromley Road, for J. Heap and Sons.

ST. HELENS.—Houses, Samuel Street, for Makin & Griffith.

SHREWSBURY.—Nurses' Home at Salop Infirmary; A. E. L. Oswell, architect, Dana Chambers, Castle Gates, Shrewsbury. Congregational Church (£3,500); Rev. W. Fry, pastor.

SOUTHAMPTON.—New Church Institute at Highfield (£3,000).

SOUTH MOLTON (Devon).—Class rooms at the United Schools. A. Lauder, architect, Bridge Buildings, Barnstaple.

SOUTHPORT.—Chapel in connection with Portland Street Welsh Presbyterian Church (£1,200).

SOUTH SHIELDS.—Fourteen houses for T. Thornton. H. Grieves, architect, King Street, South Shields.

SPALDING.—Residence for R. Barker, Stonegate.

STEYNING (Sussex).—Proposed joint isolation hospital scheme. Steyning Board of Guardians.

STACKSTEADS (Lancs.).—Pending restarting of the Tunstead Mill by a Pendleton firm.

STOCKPORT.—United Methodist School at Edgeley Park.

STOCKTON-ON-TEES.—Warehouse for the Tyne-Tees Steam Shipping Co.; houses, Osborne Road, for E. A. Jones; Buckingham Street, for R. Bainbridge; estate in Oxbridge Lane, to be laid out for building purposes, R. Appleton & Sons, estate agents, 134, High Street, Stockton.

STONEHOUSE.—Children's home for the Board of Guardians. Thornely and Rooke, architects, The Crescent, Plymouth.

SUDBURY (Suffolk).—Alterations and additions to Grammar School. A. A. Hunt, building inspector, Shire Hall, Bury St. Edmunds.

SWANSEA.—Additions to Carmarthen Road Congregational Chapel; C. T. Ruthen, architect, Swansea. Proposed new training college and schools, Uplands, for the T.C. (£80,000). Offices for the Harbour Trustees; A. O. Schenk, engineer to the Trustees, Harbour Offices, Swansea.

TENBY.—Additions and alterations at Bay View, The Norton; additions to 1, Glendower Houses, The Norton. J. Preece James, architect, Tenby.

THORPE (near Lincoln).—Wesleyan Methodist Church (£900).

TILBURY.—Residence and surgery, Peninsular Road, for Dr. A. H. Fowler; house and shop, Dock Road, for S. J. Skinner; six houses, Christchurch Road, for T. B. Colenott.

TODMORDEN.—Houses in Beaconsfield Street, Kilnhurst. Hoyle & Carpenter, contractors. New Secondary School for the Council.

TONBRIDGE.—Alterations and additions to East Peckham Schools for Kent C.C. W. H. Robinson, architect to the Kent Education Committee, Caxton House, Westminster.

TRENTHAM (near Stoke-on-Trent).—Proposed establishment of Garden Village, with own electric generating plant. G. Townsend, Stoke-on-Trent.

TRURO.—Alterations to Lis Escop, the residence of the Bishop of the Diocese; Mr. Sedding, architect. Alterations to business premises, for Webb & Co., drapers.

TWICKENHAM.—Two houses, Campbell Road; Brewer, Smith & Brewer, architects, 11, The Green, Richmond. Seven houses, Hampton Road; G. F. Sharpe, architect, 57, Chancery Lane, W.C.

WADEBRIDGE (Cornwall).—Two houses in Glen Road, for Davey & Benney.

WALKDEN.—Five houses, Wilfred Road, for J. Hallam; alterations to local Labour Institute.

WALTHAM ABBEY.—Factory for Joyce & Co., Ltd. (£14,920). W. Lawrence and Son, builders, Waltham Cross.

WANSTEAD.—Proposed new Church for Aldersbrook Baptist Church (£4,000). Rev. W. Knight Chaplin, pastor.

WANTAGE.—Business premises to be rebuilt for Valentine & Barrell, drapers, &c.

WELLS.—New laundry buildings, and alterations to boiler house at the Asylum. G. T. Hine & Co., architects, 35, Parliament Street, Westminster, S.W.

WATFORD.—House, Boreham Wood, for E. Sandon; alterations and additions to "The Cottage," Chorleywood, for Lord Tiverton; alterations and additions to "Riverside," Hunton Bridge, for L. M. Thompson.

WEDNESBURY (Darlaston).—Proposed new baths for the Darlaston District Council (£3,500).

WEST AUCKLAND (Co. Durham).—School for the Durham C.C. (650 scholars). Vaux & Mark, architects, 29, Norfolk Street, Sunderland.

WESTHOUGHTON.—Alterations and additions to 30, Church Street. E. Whittle.

WIGAN (Standish).—Houses, Almond Brook Road, for R. Baxter; Moore's Lane and Grove Lane, for J. Liptrot.

WINCHESTER.—Extension of St. Paul's Parish Church. Rev. C. H. Gould, rector of St. Paul's.

WINDERMERE.—Mansion at Fell Foot, for owner, Newcastle (£60,000).

WOLSINGHAM (Co. Durham).—School for the Durham C.C. (500 scholars). F. H. Livesay, architect, Newgate Street, Bishop Auckland.

WOLVERHAMPTON.—New Corporation Baths (£9,000). Borough Engineer, Town Hall, Wolverhampton.

WORKINGTON.—Houses, Berwick Street, for Wilkinson & Miller; Beck Side and William Street, for J. P. Bennett.

WORSLEY.—Four pairs of villas in Hardy Street for J. Tyldesley.

WORTHING.—Extension of the Swandean Isolation Hospital (£3,429). J. Longley & Co., builders, Crawley.

Houses, Highfield Road, for Tate & Co., J. E. Lund, architect; Wykeham Road, for Mrs. Forsey; Grove Road, Broadwater, for A. T. Clarke, H. M. Potter, architect; Upper High Street, for Apted, Greenfield & Co.; Sea Lane, for A. Standing.

WREXHAM.—Contemplated additional premises for the Co-operative Society.

YARMOUTH.—Additions to factory, Admiralty Road, for Johnson & Sons; additions to store, A.B.C. Wharf, South Quay, for Newhouse and Sons; additions to fishing premises, Crown Road, for C. Ellis.

YEOVIL.—New butter and cheese factory, Martock, for Paull & Co.

YORK.—Girls' secondary school, for the City Education Committee. W. H. Brierley, architect, 13, Lendal, York.

FORTHCOMING EVENT.

Saturday, July 18th.—At 7 p.m. At the Franco-British Exhibition. Institution of Marine Engineers. Paper on "The Generation and Electrical Transmission of Power for Main Propulsion and Speed Regulation," by Mr. W. P. Durtnall.

NOTES.

Electric Burglar Alarms.—Any new invention or application relating to electricity is held up by the daily papers (usually a year or two after the event) to glorification. But let there be a whisper of failure in regard to any well-established electrical device and they will tumble head-over-heels in efforts of vilification. "The lesson to be learned from the burglary at my place," said Sir Francis Cory-Wright to a *Daily Telegraph* representative, "is that electric burglar alarms are unreliable. Here was a private residence fitted up throughout with a system of electric alarms, and yet burglars coolly walk in . . . and not a single person in the house was disturbed." It seems, according to Sir Francis, that the electric alarm attached to the door through which the burglars entered his house was out of order, but all the others were in good condition. Sir Francis had been informed by his butler, however, that they were frequently going wrong.

Now, if Sir Francis knew of this before the burglary, he should have had the alarms seen to by a competent person, and failure to do so makes him practically an accessory before the fact. If, on the other hand, the butler knew of it, but only told his master afterwards, he must be deemed guilty of remissness in his duty. In any case someone is culpable, and to proclaim burglar alarms as unreliable shows not only ignorance but neglect of the ordinary duties of a householder to his house. As well might a man fail to have his kitchen boiler cleaned for ten years, and when it bursts condemn it as unreliable.

Burglar alarms are, as everyone knows, merely mechanical circuit-closing or breaking devices; they, and the battery and bell which they control, should be kept in order as well as locks, water-pipes, boilers and other fittings connected with a house. If the householder has not made himself acquainted with their method of working, he should leave their maintenance in the hands of an electrical contractor. If he takes this duty upon himself, he must see that the battery is always in proper order, and that the devices do not fail to work owing to dirty contacts, warped doors or window-frames, &c. In the present instance it is impossible to state the actual cause of failure without further knowledge of the facts; but as the burglars got into eight rooms, the doors of which were all fitted with contacts (and assuming that the burglars were not better acquainted with the alarms than Sir Francis and his butler), it is pretty clear that the battery must have been out of order, or that a common connection was broken. Under the circumstances, to make such a sweeping assertion as that attributed to Sir Francis is unjustifiable. He would be well advised now to have the installation overhauled and properly maintained, while a test switch, for the butler to operate every evening before retiring, might be useful.

Cricket.—Mansfield *v.* Chesterfield Electricity Departments.—Teams representing the above departments met on the Town Ground at Mansfield for the second of what is hoped will be annual fixtures, on Wednesday last week. Chesterfield batted first, and compiled the respectable total of 126. H. C. Heys took seven wickets. Mansfield then went in, and the runs were hit off for the loss of only two wickets. H. C. Heys 85 and F. O. Foulds 28, not out, were responsible for the bulk of the runs. Both the match and the subsequent tea and smoker were much enjoyed.

Notes from New Zealand.—According to a report from Dunedin, Messrs. Noyes Bros. are issuing a writ against the City Corporation for £7,339, being the balance of commission alleged to be due in connection with the Waipori works.

Mr. Small, chairman of the Dunedin Finance Committee, in a report on city trading investments, advocates setting aside adequate sinking and depreciation funds—which is not now done—for tramways, electric power, water and gas departments. He estimates that there should be at least £30,000 per annum, and this will leave a net profit of £15,000.

The Ross Goldfields Co., Ltd., has received intimation that Messrs. Maben & Welch, contractors, have ordered pumps and complete plant in England. The unwatering and opening-up of the mine will cost £50,000.

Sequel to Fife Pit Disaster.—Eight actions, involving about £5,000, have been called in Kirkcaldy Sheriff Court against the Fife Coal Co., Ltd., for damages in respect of death and injuries to miners as a result of the recent disaster in the Mary Pit, Lochore. The explosion, it will be remembered, was caused by a spark from an electric motor used for driving a fan, in connection with the working of which a number of officials were recently prosecuted. Three young miners were killed and five seriously injured. The cases were debated on the question of conjoining them, and the Sheriff made avizandum.

Moscow Electric Tramway Contracts.—According to the Moscow correspondent of the *Standard*, after 18 months' discussion, the Moscow electric tramways extension has been undertaken by the municipality, but large orders have been placed abroad. The original British scheme fell through. The largest orders given abroad, however, will still fall to British firms. Messrs. Dick, Kerr & Co. and the British Insulated and Helsby Cables have secured orders to the value of £83,000, while three orders for smaller amounts have gone to two German firms and one Swiss firm. The correspondent continues:—"For the supply of electrical engineering appliances hitherto Germany has been unassailable in Russia, owing to the fact that she possesses extensive works in this country, which the Government, by pressure, has practically compelled the municipalities to favour, irrespective of prices and other conditions, on the ground that they employ Russian labour. The Mayor of Moscow, M. Nicholas Guchkoff, brother of the leader of the majority in the Duma, ventured to show his independence of Ministerial dictation in the present case, in favourable contrast with the municipality of St. Petersburg, whose action early in the year compelled British tenderers to retire from a similar competition. The Moscow order obtained in the open market is the first real footing the British electrical industry has won in Russia. The work will be carried out wholly in Lancashire, making amends to the North of England for the import of Russian rails recently complained of."

Institution and Lecture Notes.—Tramways and Light Railways' Association.—Prof. Carus-Wilson's lecture on "Rail Corrugation," which was delivered at the Shepherd's Bush Congress on Friday last, is to be discussed at a meeting of the Association at the offices, 35, Parliament Street, S.W., on Friday next, July 24th, at 4 p.m. We are asked to state that the model shown by the lecturer will be on view for half-an-hour before the meeting.

Society of Engineers.—By permission of Messrs. James Powell and Co., the members of the Society paid a visit to the Whitefriars Glass Works, Tudor Street, E.C., on July 14th.

Breathing Ozone.—Writing to the *Times*, Sir Oliver Lodge points out the danger of breathing air artificially charged with ozone. While this substance is an excellent disinfectant, and perfectly harmless when present in natural quantities, it may cause very injurious effects if inhaled in excess, and Sir Oliver quotes a painful experience of his own in support of this statement. His action is due to the marketing of apparatus for the domestic manufacture of ozone.

Appointments Vacant.—Junior assistant engineers for the Yorkshire Electric Power Co.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station Officials.—MR. P. F. ROBERTS, who has been switchboard attendant at the Kettering U.D.C. electricity works for the past three years, is this week proceeding to Kilmarnock, to take up a similar position there.

MR. HARRY COTTAM, of the Mansfield Corporation electricity works, is leaving there in order to take up, on July 20th, the position of shift engineer at the Dewsbury Corporation electricity works.

MR. PERCY THORNBER, borough electrician of Summerland, British Columbia, was married on July 8th to Miss Lilian Bourn, hailing from Preston, who sailed for British Columbia some weeks ago.

The Poplar Borough Council has decided to increase the salary of MR. J. H. BOWDEN, borough electrical engineer, from £500 to £600 per annum.

Tramway Officials.—The directors and members of the New England Club, Peterborough, have presented a gold watch to MR. J. R. GROVES, manager of the B.E.T. Co.'s system, who is leaving the city, in recognition of his services to the club.

The tramway staff at Bournemouth has presented an inlaid mahogany bureau to MR. P. A. HISCOCK on his marriage.

General.—The board of the Mersey Railway Co. some time ago resolved to appoint a general manager who is an electrical engineer, and MR. J. SHAW, M.Inst.C.E. and M.I.E.E., the resident engineer of the company, has been appointed to the position; he entered on his new duties on Monday last. Consequent on this appointment MR. R. BOWMAN SMITH, the present traffic manager of the company, has intimated his resignation, and he will cease to act in that capacity, but his services have been retained for the company until the end of the present year. The general offices of the company will now be transferred from James Street, Liverpool, to Central Station, Birkenhead.

MR. C. C. HAWKINS, who has resigned the position of chief of the electrical department at the works of Messrs. W. H. Allen, Sons & Co., Ltd., Bedford, has been presented by the directors with a Georgian silver tea service and salver.

We are informed that MR. CHAS. W. D. NEWMAN, A.M.I.E.E., A.M.I.Mech.E., for six years past chief assistant to Buchan and Partners, consulting engineers, Edinburgh, has recently started a practice on his own account in South Wales, where his address is 31, Rawden Place, Cardiff.

On Friday last the local staff of the Manchester branch of Siemens Bros. Dynamo Works, Ltd., presented MR. PHILIP C. POPE with a gold watch, on the occasion of his resigning his position as manager of the branch office. MR. EDMUND L. HILL, who has been appointed to take Mr. Pope's position, made the presentation before the whole of the staff. We understand that Mr. Pope is leaving to take up a position with Messrs. John Musgrave & Son, engineers, of Bolton.

CITY NOTES.

Consolidated Electrical Co., Ltd.

MR. HERBERT ALLEN presided at the annual meeting held at River Plate House, on Monday, and in moving the adoption of the report, he said that the year's income from interest, dividends and so forth was £6,941, a decrease of £591 as compared to the previous year. This decrease was more than accounted for by the fact that in the previous year there was a cash profit of over £1,200 by underwriting. Their investments, as a whole, were far from being overvalued in the balance-sheet, at £82,256. The Consolidated Supply Co., Ltd., to which they handed over the Canonbury works and business a few years ago, had at length gone under. That company was unable to continue the struggle without further assistance on the part of this company, but that assistance they were not prepared to give. The concern had been given a fair chance, and in the end had been found wanting, and this company had now done with it. When Mr. Baylor came upon the scene with new ideas and new business in new industries—such as electric tramcar and motor-'bus appliances and accessories—they were a little more hopeful, but both of those industries had passed under a cloud, for the building of tramcars was almost at a standstill at present, and of motor-'buses, the less said the better. He thought that the shareholders would not be sorry to feel that they had shaken off the Canonbury incubus at last. What they would save from the wreckage it was too early yet to say. There were the works and the stock that had accumulated over a period of years, and they would be pleased to hear of a purchaser or tenant. Unfortunately, however, similar small establishments in the light engineering trades abounded without tenants all over the country, but they had one consolation; however little they might recover from that concern, they had, at all events, about come to the end of their losses there. To protect their interests as debenture-holders, they put in a Receiver some time ago, and about nine-tenths of what was realised in the winding up should come to this company. As to the Private Wire and Telephone Co., this concern had never loomed very large in their accounts. It had managed to struggle along for some years, and when he last addressed them, it looked almost as if it had turned the corner and become self-supporting, but that prospect was of brief duration. Remunerative orders in that line had become more and more difficult to procure, and it was impossible for small and impecunious concerns to compete successfully with powerful competitors like the National Telephone Co., and the General Post Office. The Private Wire Co., therefore, looked like going the way of the Supply Co., and so far as they were concerned, it was practically done with. Time was, and that only three or four years ago, when the disappearance of the Canonbury and Private Wire businesses would have caused them grave concern. Happily they were now able to face the loss of them with comparative equanimity, because, whilst hoping for better things, they had been quietly and imperceptibly preparing for what had happened. In other words, they had anticipated the entire loss by what they had already written off. In 1903-4 they took the precaution to write down the value of the stock and plant by about £20,000. In 1905-6 they wrote down the goodwill by over £16,000, and so-called investments by over £4,000, at the same time writing off preliminary expenses of nearly £2,000. In 1906-7 they wrote down certain other investments by a further £4,500, and now they had a surplus at credit of profit and loss account, after payment of a fair dividend, of £6,635, which would come in very handy, if necessary, as a set off against any further and final loss in closing up the Canonbury premises. The Anglo-Portuguese Telephone Co., in which they were so largely interested, and which indeed was their mainstay, continued its career of increasing prosperity, and had felt justified in increasing its dividend from 7½ to 8 per cent. There were probably few shareholders in this company now who realised that (under their old name of the Consolidated Telephone Construction and Manufacturing Co.) they promoted not only the Anglo-Portuguese Telephone Co., but were sponsors for the original telephone system of Italy, Austria and Argentina (all of which had grown to great dimensions). The success which had attended British telephone enterprises in foreign countries had been most striking, and he was unable to recall a single instance in which they had not given a handsome return on the capital sunk in them.

After further remarks, the motion for the adoption of the report was seconded by MR. C. WOOLLEY, and carried unanimously.

The resolution for a dividend at the rate of 3½ per cent. per annum on the ordinary shares was passed, and the retiring director and auditors were re-elected.

Lancashire Power Construction Co., Ltd.

THE directors' report to September 30th, 1907, was presented at the meeting held at Winchester House on Tuesday. It stated that in order to meet the requirements of the district it had been found necessary to carry out additional work beyond that originally contemplated. For this purpose further capital expenditure was and will be necessary. "In these circumstances the board decided to consult some of the largest shareholders as to the best means of dealing with the situation. At an informal meeting a committee of shareholders and directors was appointed to consider the position and report to the shareholders. Numerous meetings have been held, and the Committee has made recommendations for the raising of fresh capital, in which the board fully concur, and which are embodied in the report of the Committee sent herewith. The district in which the company operates contains a large number of power users, and the board confidently expects within a comparatively short time to so enlarge the company's business as to make it profitable, and they, therefore, unanimously concur in the Committee's recommendations for the raising of further capital, and request the approval of the shareholders. Notices are enclosed for meetings at which the necessary resolutions will be submitted to give effect to the recommendations of the Committee. As will be seen from this report and statement of accounts, the total liabilities amount to £53,765. The Committee recommends that further capital to the amount of £150,000 be raised by the creation of 5 per cent. debenture stock, to be offered to the shareholders at par, with a bonus in 4 per cent. income bonds of 50 per cent. of the amount of debenture stock subscribed for. At present the receipts of the Lancashire Electric Power Co. for current supplied are more than sufficient to meet all station expenses, and to bear a considerable proportion of the administration, office and development charges. The results would have been much better had not the company, along with all manufacturers, suffered severely from the abnormally high price of coal which prevailed during 1907. As has been the experience of all similar undertakings, the establishment of the business of the Lancashire Electric Power Co. has taken much longer than was expected, and many unforeseen difficulties have had to be overcome. The development of the business had been retarded, owing to the difficulty in the past in making satisfactory arrangements with the local authorities, but with the completion of the agreements for supply, direct and in bulk, referred to below, these difficulties are at an end, and a large extension of the company's business may now be anticipated. The number of inquiries now being dealt with give a most favourable indication of the extent of the future business which may be expected, leading to the complete employment of the existing plant in the generating station. The Power Co. is already giving a supply in bulk to the Urban District Council of Swinton and Pendlebury, and has made agreements for a supply in bulk to the Urban Districts of Farnworth and Hindley; it has made agreements to take over the provisional orders granted to the Councils of the Urban Districts of Ramsbottom, Tyldesley, Little Lever, Little Hulton, Kearsley, Worsley, Whitefield, West-

houghton, Abram and Aspull, and of the Rural District of Bury, and is now in a position to supply direct to power consumers in the said districts; and negotiations with other local authorities are in progress. The Power Co. has also itself obtained a provisional order authorising the supply of electrical energy in the Urban District of Tottington.

The company commenced to supply power in October, 1905, and the following is a statement of output:—

	1906.	1907.
Units sold	3,043,723	5,380,847
Works costs per unit sold ...	·476d.	·368d.
Total costs	·728d.	·561d.
Connections	3,280 H.P.	4,342 H.P.

At the end of the period covered by the accounts 4,052 H.P. were connected with the company's mains out of a total capacity of approximately 12,000 H.P. Since then, additional customers have been secured, and there are now, approximately, 4,600 H.P. connected with the mains, besides a further 1,045 H.P. arranged for, but not yet connected.

A considerable proportion of the present output is supplied under one contract which was taken as an experiment at rates which experience has shown to be unremunerative. This contract has now only a little more than a year to run, and the consumers wish to arrange a new contract to replace that now existing on lines which are much more favourable to the company. The directors regret to report the resignation of Mr. H. Wolfenden and Mr. Mark Barr, two of the directors, on account of pressure of other business.

Mr. T. O. Callender presided at the meeting held at Winchester House on Tuesday, and in moving the adoption of the above report, he said that there had been great delay in getting the Lancashire Power Co. to work. When they erected their station and laid their mains, and were in a position to supply, they found that the position which they held was misunderstood by many of the local authorities, and that instead of being looked upon as a useful member of society in Lancashire, they were considered as a bitter enemy by most of the local authorities. They did their best to alter that position, but it took a long time before they could make any impression upon the authorities who had the power to say whether they should supply or not. Practically two good years were wasted. During the first two years of the company's practical existence, after the station was built, they were able to do but little in any part of their area, and it was only since they had become better known to the authorities, since they had appreciated the object of the company's existence, that they had overcome those objections, and that they had got into the position in which they now were, which position would, he believed, be materially improved in the immediate future. As the report showed, they had made arrangements with three local authorities to supply them with electricity in bulk, and no fewer than 12 other local authorities had handed over to them their provisional orders to be carried out. Nothing he could say would be such strong evidence of the changed attitude of the local authorities. That, however, had not been brought about easily. It had meant an immense amount of trying and heart-breaking work. They found that it was necessary for them to apply for orders. They did so, and with the exception of one order, as soon as they sought to get powers the local authorities themselves applied, stopped them, and took out their own provisional orders. This company made arrangements with them, and fortunately, among the 11 orders to be transferred, several were those which were originally applied for by the company. This explained to a large extent the reason of the delay, and the reason why their progress had been so slow. Another point, strange as it might seem, had been the booming prosperity of Lancashire. When things were so good among manufacturers as they had been in Lancashire, it was hopeless for any person to introduce electrical power or any other improved methods on a large scale. The people to whom they went in the hope of getting them to install improved machinery said, "Right enough—good improvement—a proper thing to do—but we are too busy to look at it!" They would not stop their mill for one single day, or slacken their production for one week, while they had that excellent trade. That was quite a sensible point of view for them, but it was unfortunate for this company. That fact, together with the action of the local authorities, explained why such small relative progress had been made, and why they were not making a much larger profit. They had, roughly speaking—allowing for spares—only one-third of their capacity employed. They were at present supplying from the station 4,000 H.P., and they could supply, without any additional machinery, simply with the additional mains and connections, three times as much, namely, 12,000 H.P. In regard to the further finance necessary, they found that a considerable amount of money would be required to pay the amount owing by the company, and to carry out the extensions which were necessary if they were to make it the success which they originally expected, and which they still hoped for to-day. In view of the difficulties of the money market, and especially the difficulties of raising money for industries of that kind, they called together an informal meeting of some of the largest shareholders, gentlemen who were interested in financial matters, and who thoroughly understood the position of things in London, and could give the best possible advice. A committee was formed and had issued its report which had been circulated. It was the opinion of the committee that the best method of raising money was that which would be dealt with at the following meeting. There was no doubt that the directors and committee felt that it was absolutely necessary to raise the money, and that it was necessary to make one bite at it and raise a larger sum than was required for clearing the position, so that when the further extensions had to be made they would have the money in hand. The expenditure of the company had been somewhat in excess of what was originally anticipated. The excess amount was £37,000, but very little of that had gone on plant, machinery, buildings and distribution system, the difference here being only £4,000. It had been necessary in order to push the business to expend large sums of money on machinery on the hire-purchase system. After careful consideration the directors came to the conclusion that that was indispensable, and that in order to push the business they would have to adopt the plan employed by many electric systems and supply the plant to a certain extent on the hire-purchase system. No less than £10,900 had been expended thereon. Their various acts cost £25,100, or £4,000 more than they originally anticipated. Development of the business had cost £13,000. That development was expected to be taken over by the Lancashire Power (Parliamentary) Co., but under the circumstances which had arisen it had been necessary for this Construction Co. to carry on the development of the Lancashire Power Co. in a way which was never anticipated. In the original scheme it was anticipated that £12,600 would be necessary to meet the loss before the company was in proper working order, but owing to the long delay that loss had been actually £16,700, so that they were £4,000 worse off than they expected to be. They did not see how that expenditure of £37,000 could have been avoided. Circumstances had arisen which prevented their carrying out their policy of the undertaking in the way which was originally proposed. The receipts of the company at the present moment were sufficient to pay its station expenses, and they were in hopes that all they wanted now in order to leave them with a considerable balance on the right side was additional customers, and these they were striving most strenuously to obtain. As the report showed, considerable progress had been made during the past year in units sold. About one-fourth of their day-load was under contract. They were in negotiation with a number of would-be customers who, now that affairs in Lancashire were less busy, were turning their attention to practically putting electrical supplies into their works. Some of these matters had already been settled, and they were finding more and more inquiries for current and more and more disposition to enter into relations with the Lancashire Co. In regard to one particular contract entered into at unremunerative rates, when the matter was brought before the board, it received very careful consideration, and it was agreed that it was absolutely impossible to find out what the proper cost of driving this particular installation was. The only thing to do was to take a contract for a limited number of years, and see for themselves. It was a heroic remedy, but it was the only thing they could do. Though it had been directly unremunerative, it had paid the company in the knowledge it had given, in the prestige gained, and by showing that the company was in a position to deal with the staple industries of Lancashire. As soon as possible they indicated that they could not renew the contract at the same prices, and the owners had expressed their willingness to enter into a contract with them on much more satisfactory terms. They would then be able to do it at a small profit.

Mr. F. E. Gripper seconded the motion, and it was adopted.

Mr. Callender was re-elected a director.

A special meeting followed, at which resolutions were passed, adopting certain new regulations necessary to bring the company into conformity with the New Companies' Act, authorising the creation of £100,000 income bonds, and approving an agreement with Mr. H. F. Parshall, under which he becomes chairman of the company, and receives £1,000 a year salary, with a commission of 10 per cent. on the profits in excess of £20,000, calculated before charging interest on the debenture stock and income bonds. The following directors are also appointed:—Sir R. A. Hampson, Mr. John Young, and Mr. J. L. Rushton.

Bruce Peebles & Co., Ltd.

A series of meetings were held in Edinburgh on Friday last in connection with the reconstruction scheme of this company. Under an order of the Court of Session, separate meetings were convened of (1) the debenture-holders; (2) the creditors other than debenture-holders; (3) the holders of preference shares; and (4) the holders of ordinary shares. Mr. J. A. Robertson Durham, chartered accountant, Edinburgh, one of the joint liquidators, presided at all the meetings, and Mr. A. W. Tait, the other liquidator, was also present.

Debenture-Holders.—The arrangement proposed is that the present debenture-holders are to get first debentures in the new company for the present amount of their holding, viz., £75,000. The debentures are repayable in 10 years—July 1st, 1918—and are secured on the heritable property and fixed machinery, but they have no charge on the movable plant, book debts and other loose assets. The debentures carry interest at 5 per cent. per annum as at present, and a sinking fund of 2 per cent. has to be set aside for redemption purposes. One-third of the surplus profits, after payment of a dividend of 6 per cent. per annum on the issued capital, is to be also set aside for this purpose.

The Chairman stated that the scheme was presented under the Companies' Acts of 1870 and 1900. The liquidators had received proxies as follows:—Creditors, £158,472 in favour, and only £2,810 against. Of debenture-holders there were £22,700 in favour, and only £500 against. In one or two cases conditions were attached

to the proxies. Of the ordinary shareholders there were £106,510 in favour, and £5,075 against; and of preference shareholders, £29,305 in favour, and £4,700 against.

Mr. Gilbert Taylor (London) representing a holding of £25,000, said they had subscribed to the debentures on a 6 per cent. basis. At the last meeting they gave way, however, on the stipulation that they should have two nominees on the board; but this question was evidently to be left to the decision of the Court, so that at present they had not obtained any concession. He proposed to vote in favour of the scheme upon the condition that the debenture-holders were given two nominees.

Mr. John Wilson moved that the scheme of arrangement be approved of, and that the confirmation of the Court of Session be obtained. He was hopeful that there was sufficient strength and backbone in the firm to make it eventually a profitable and useful concern, and so far as he could see the liquidation was being carried through most judiciously and wisely.

Mr. W. A. Murray, representing a debenture-holder, who disapproved of the scheme, moved the previous question.

Mr. Gilbert Taylor decided that he would not press his motion, but he asked the liquidators to state their views fully and fairly to the Court, and in reply to Mr. Taylor, Mr. James Watt, W.S., of Messrs. Davidson & Syme, W.J., agents for the liquidators, said that that would be done, and that Mr. Taylor could be represented when the matter came before the Court.

On the vote being taken, three voted in favour of the scheme and one against, the respective values being:—For, £54,450; against, £500.

Mr. Taylor then moved that Mr. A. W. Tait and Mr. A. B. Anderson be nominated on the board as representing debenture-holders, and this matter will be left to the Court to determine.

The Creditors.—Here followed the meeting of the creditors. Under the scheme the creditors are to receive in respect of their admitted claims 7s. 6d. in the £ in a second debenture, carrying interest at 6 per cent., and 12s. 6d. in the £ in ordinary shares of the new company, credited as fully paid. The second debentures are repayable, either wholly or in part, at any time at 14 days' notice by the company, and, in any event, are repayable in ten years from the date of issue. Creditors whose claims are under £10, may, if they choose, receive a composition of 5s. in the £ payable in cash in three months from the date of the allotment of the capital of the new company, instead of debentures for 7s. 6d. in the £ and shares for 12s. 6d. per £. All fractions of debentures and shares to which creditors may be entitled will be satisfied by a cash payment equal to 5s. in the £ of such fractions.

Mr. T. O. Callender, London, moved the adoption of the scheme. That was the best thing that could be done. As one of the largest creditors he had gone personally through the works, and had taken a lot of trouble over it.

Mr. A. D. Mackenzie seconded. He was the largest of the Scottish creditors. They had gone into the matter to the best of their ability, and from all they had learned, and from their knowledge of the state of the works, and the undoubted value of the goodwill of Bruce Peebles & Co., they were able to say that that was the best course to take. With reasonable luck, and good prospects of improvement of trade generally, and with good management, they saw no reason to doubt that the concern might be brought round and be made a valuable asset for the creditors and shareholders.

Mr. Gyaros, representing Ganz & Co., Buda-Pesth, thought they should have fuller information as to the debts of the old company before being asked to commit themselves one way or another. He moved that they adjourn, that the liquidators might submit fuller information as to the assets and liabilities of the company.

Mr. G. Schultz, London, seconded. It seemed to him absurd that business men should be called together to consider a scheme so incomplete. There was not a word given from beginning to end of that liquidation as to the real condition of Bruce Peebles & Co. It was desirable to adjourn the meeting until they had received at least an assurance from the members of the committee appointed by the shareholders that they had investigated the figures that they had recommended.

Mr. A. W. Tait said the claim put in by Messrs. Ganz & Co. was at that moment subject to adjustment, and was not admitted. It was through Messrs. Ganz & Co. that Bruce Peebles & Co. lost a large sum of money in Canada, and it was well known to a section of the creditors that a substantial amount was used in putting that right. The Committee had gone carefully into the position of the company, and they would not have signed the circular unless they had been fully satisfied about the scheme. The longer they delayed taking decisive action, they were simply taking money out of their own pockets.

Mr. Ward, General Electric Co., thought the scheme should be considered further.

Mr. Tait said that, notwithstanding the strong appeal which Mr. Ward had made for everybody in the electrical business to come out of it, he believed that the electrical industry had probably seen its worst, and they all hoped that in the future it would be better.

Mr. Brening (Messrs. Allan & Co., Sheffield) asked if the Creditors' Committee were unanimous in recommending that scheme, and Mr. Robertson Durham replied that that was so.

Mr. Watt said the directors would be acting in the interests of the concern if they applied for a Stock Exchange quotation in Edinburgh.

Mr. Tait further stated that no obligation or understanding had been given that the Committee would report back to the creditors.

In reply to a question as to the position of the liquidation at hat moment, the Chairman said they had given a balance-sheet as February 15th, and he was not going to give any guesses. The figures were the figures at the date of the liquidation. They had done their best to carry on the business. They had a large number of orders for a company in their position, and they had kept the thing going at a smaller loss. While they had lodged a large number of claims by creditors about which there was no doubt, there were a considerable number in a very doubtful position. There was a sum of £170,000 in the books said to be due. Speaking roughly, the claims lodged amounted to £310,000, but he hoped the total would not materially exceed what appeared in the books at February 14th. A so-called balance-sheet at the present time would only have been misleading.

Mr. Ridge-Beedle (Glasgow) considered it was folly at this time for creditors to come forward when the Committee had reported in favour of the scheme. If the matter were thrown back it might be impossible to bring matters so far forward as they were now, in consequence of which the works would, perhaps, have to be broken up at scrap prices, and the creditors would get absolutely nothing. As a preference shareholder also—Mr. Ridge-Beedle added—he was prepared, if necessary, to put his hand in his pocket, and if the preference shareholders were willing to do that, it said little for the creditors if they objected to this scheme.

After the Chairman had explained that it was, by law, incompetent for them to adjourn, the vote was taken.

Three were against the scheme, viz.:—Ganz & Co., £14,500; General Electric Co., £343; Morrison & Gibb (printers), £213. For the scheme the total amount, including proxies, was £158,472, and against £17,888. The scheme was, therefore, approved of.

The Shareholders.—The preference shareholders are, on application, to be allotted three ordinary shares of £1 each in the new company, credited as 13s. 4d. paid up, for each £5 preference share held, and the balance of 6s. 8d. per share (which is equal to £1 per share of the old company) will be called up in cash.

At the meeting of the preference shareholders, Mr. Hugh Mayberry, Glasgow, said that the scheme appeared to be well constructed and fair.

Mr. Rich, London, inquired as to the trade prospects. Had they any talisman that would enable them to compete with the prices in the electrical business to-day? In reply, the Chairman said he could not tell whether the electrical business would succeed or not, but he put before them the views of the gentlemen who were competent to judge. The shareholders must be guided by the recommendations of the Committees; if not, then they must take their own course. Every one of the Committee knew the electrical business. It was an influential and strong Committee.

After Mr. Day had made some objection to the principle of the scheme, a shareholder asked whether the company had been carried on at a profit or not during the last five months. The Chairman, in reply, said they could not answer that question, because to do so they would require to take stock. They were, he would add, surprised at the success they had had in carrying the business on. There were far more orders than he expected; they had reduced expenditure; and if there was a loss it was a great deal less than they had anticipated.

On a vote being taken, the requisite three-fourths majority was obtained, the figures being:—For, 37,300; against (including £3,800 of shares, the owners of which did not vote), £11,350.

The Ordinary Shareholders.—The ordinary shareholders are, on application, to be allotted one new ordinary share of £1 each, credited at 10s. paid up for each £5 ordinary share held, and the balance of 10s. per share will be called up in cash.

The voting resulted in 925 shares being for the scheme, and only 30 against. The proxies in favour amounted to £106,510, and against, £5,075.

As the result of the various meetings the scheme of arrangement of June 15th, 1908, has been approved of. This scheme will now have to be brought before the Court of Session for approval.

Electrical Power Storage Co., Ltd.

The directors' report to May 31st, 1908, to which we briefly referred last week, shows a profit for the year, including the balance of £787 brought forward, of £4,861, out of which the directors recommend the payment of a dividend of 5 per cent. on the paid-up ordinary share capital, which will absorb £4,491, and leave £369 to be carried forward. The buildings, plant, tools, &c., have been maintained in thorough repair and condition at a cost of £3,046, which sum has been provided out of revenue. The debentures, amounting to £28,400, which appeared in the last balance-sheet, have been redeemed. These have been replaced to the extent of £10,000 (part of an authorised issue of £30,000), thus reducing the debentures outstanding by £18,400. Owing to the fluctuations in the price of lead and other raw materials, together with the general depression in trade, the volume of business has somewhat decreased as compared with the previous year. The meeting was held in London yesterday.

Electric Construction Co., Ltd.

The directors report a satisfactory increase in the volume of the company's business during the financial year. The amount of work in progress is considerably greater than at this time last year, including large power installations for India and the Midlands, in addition to machines of all sizes for home and abroad. The industry, however, is still suffering severely from over-production, and a small margin of profit only is obtainable. The net profit for the year,

after payment of £10,250 for debenture interest, and crediting £5,000 as formerly to depreciation account, is £5,932. The sum brought forward from last year is £209 and the amount available for distribution is therefore £6,141. The directors recommend that this profit be appropriated in payment of the dividend on the preference shares for the year ended May 31st, 1907, £4,395, leaving a balance to be carried forward of £1,746. In view of the volume and character of the work in progress, the directors hope to declare, about the end of December, a dividend on the preference shares for the year ended May 31st last. In accordance with the arrangements described by the chairman at the last annual general meeting, the directors have subscribed for £5,000 4½ per cent. preferred ordinary shares of the Madras Electric Tramways (1904) Ltd. A portion of the company's holding in the tramways has now been disposed of, and a depreciation of £2,000 on the realisation has been debited to general reserve fund. The directors are pleased to report a marked improvement in the traffic receipts from the tramways during the past few months.

[The above statement represents a substantial improvement. For the previous year the operations showed a loss of £1,442, which taken from the balance then brought forward left only £209 to be carried forward to this year.]

National Telephone Co., Ltd.

The directors' report shows that the income accrued in respect of the business of the half-year ended June 30th, amounts to £1,452,826, as compared with £1,315,038 for the corresponding period of 1907, being an increase of £137,787. The working expenses amount to £832,638, as compared with £749,760 for the corresponding period of 1907, being an increase of £82,878. The net result for the half-year (after deducting the Post Office royalties amounting to £139,547) is a profit balance of £480,641, as compared with £439,980 for the corresponding period of 1907, being an increase of £40,661. The rentals carried forward for unexpired terms of running contracts amount to £1,314,591, as compared with £1,210,117 at the corresponding period of 1907, being an increase of £104,474. Out of the available balance of £369,427, shown by the net revenue account, the board will recommend the payment for the half-year of a dividend at the rate of 6 per cent. per annum on the first and second preference shares, 5 per cent. per annum on the third preference shares, 6 per cent. per annum on the preferred stock, and 6 per cent. per annum on the deferred stock, less income-tax in all cases. The board also propose to transfer £140,000 to the reserve fund account, and to carry forward the balance of £10,677. £496,584 has been expended on capital account during the half-year in the erection of 16,761 additional exchange and private stations, and in the construction of underground works.

United River Plate Telephone Co., Ltd.

The directors' report states that for the year ended March 31st last, the gross receipts in sterling in the River Plate were £250,750, as against £216,204 for last year. Deducting expenses in Argentina and London, debenture interest, dividend on preference shares, and interim dividend on ordinary shares, and adding interest on investments, transfer fees, &c., there remains a profit of £77,740, to which must be added £4,070 brought forward from the previous year, making an available balance of £81,810. The introduction of the common battery system has necessitated the replacement of part of the overhead by underground plant, and also other changes. The cost will be carried to a special replacement account as the work proceeds, and be gradually written off. After applying £25,000 to the reduction of this special replacement account, and after meeting the cost of paying off the old debenture stock and the issue of the new, the directors recommend that a final dividend of 5 per cent. be paid up on the ordinary share capital of the company, making, with the interim dividend paid December 31st last, a return of 8 per cent. for the year, free of income-tax, and that the balance of £4,904 be carried forward. The new issue of ordinary shares referred to at the last general meeting has been made, and the whole amount subscribed. The first instalment was payable on April 1st, 1908, and only the amounts received in advance of the due date come into the balance-sheet.

Yorkshire Electric Power Co., Ltd.

A special meeting of this company, to sanction the issue of new capital, was held on 9th inst. at Leeds, Mr. A. G. Lupton presiding.

The Chairman, alluding to the death of Sir Richard Mottram, a director, said that the board had asked Mr. A. Meysey-Thompson, one of the first shareholders, to step into the breach. This he had consented to do. At the February meeting he (the chairman) told them that it would be necessary to raise new capital to meet arrangements made with customers in Brighouse and other places. The amount now required was £45,000, and after giving the subject full consideration, the directors had come to the conclusion that the most advantageous method of raising money was on a second mortgage of the undertaking ranking directly after a sum of £40,000 owing to the bank. The directors propose to ask the shareholders to provide the money on the following terms:—Repayable at the end of five years if desired by the lender, with the option to the company of repaying it any time after two years, six months' notice on either side; repayment to be made at the rate of £105 per £100 subscribed; and interest, payable half-yearly, at the rate of 6 per cent. per annum. The money was wanted to extend the company's mains into new districts. When all their new customers had been connected, it was estimated that there would be a revenue of £18,000 a year, and that there would be a considerable balance of profit. The proposal of the directors had received the endorsement of a private and informal meeting of some of the principal shareholders.

The resolution authorising the issue of fresh capital to the extent of £45,000 was seconded by Mr. T. O. Callender, and carried unanimously.

Thomas Parker, Ltd.—A circular has been issued by this company dated July 14th, and reading as follows:—"Owing to the increasing demand for Rees Roturbo pumping and other machinery, for which Thomas Parker, Ltd., holds the sole manufacturing right for Great Britain and Ireland, the present working capital of the company has been found to be inadequate for the increased business. Consequently a new company is being formed entitled the Rees Roturbo Manufacturing Co., Ltd., which will take over the whole of the assets and liabilities of Thomas Parker, Ltd., and carry on the business as a going concern. The directors of Thomas Parker, Ltd., intended originally to transfer the business under the powers given them in the memorandum and articles of association of the company, and at a meeting of shareholders in April this scheme was passed unanimously. Owing, however, to a judgment given in the High Court immediately after this meeting, the directors were advised that it would be necessary to proceed by a voluntary liquidation and a transfer by the liquidator under Sec. 161 of the Companies' Acts of 1862. The necessary meetings of shareholders have now been held, and the scheme has been passed, and the company is now in voluntary liquidation for the purpose of carrying out the scheme, in full accordance with the advice of counsel. In the meantime, the business will go on as usual."

Companies to be Struck Off the Register.—The following are to be struck off the register within three months, unless cause is shown to the contrary:—

Cox Thermo Electric Co., Ltd.
"Holophane," Ltd.
Patent Universal Smoke Condenser Co., Ltd.
Simplex Electric Tramway Conduit Syndicate, Ltd.
Standard Dynamo and Motor Manufacturing Co., Ltd.
United Electric Wire and Telegraph Works, Ltd.

The under-mentioned has been struck off the register, and is accordingly dissolved:—

New Electric Light Syndicate, Ltd. (Registered December 12th, 1895.)

City and South London Railway Co.—The directors have declared a dividend at the rate of 1½ per cent. per annum on the consolidated ordinary stock for the half-year ended June 30th. £1,500 is placed to renewal fund, and £1,868 is carried forward. Last year the dividend was at the rate of 2½ per cent. per annum.

New Issue.—The *Times* says that preliminary arrangements are being made for an issue of £500,000 Toronto Light and Power 4½ per cent. debentures.

Stock Exchange Notice.—Application has been made to the Committee to allow the following securities to be quoted in the Official List:—

Metropolitan Electric Tramways, Ltd.—891,387 ordinary shares of £1 each, fully paid (special application).

Platinum Substitutes, Ltd.—A special meeting of this company was held on Monday last at Winchester House. We were informed that the proceedings were not open to the Press, and that the business to be done related to proposed alterations in the capital arrangements of the company.

Newcastle-upon-Tyne Electric Supply Co., Ltd.—The directors have declared an interim dividend of 2½ per cent. on the ordinary shares for the past half-year. Last year's interim dividend was at the same rate.

Telegraph Construction and Maintenance Co., Ltd.—The directors have declared an interim dividend of 12s. per share. This is at the same rate as for last year.

Dublin United Tramways Co., Ltd.—The directors recommend a dividend for the half-year ended June 30th, at the rate of 6 per cent. per annum, free of income-tax, on the ordinary shares, carrying forward £6,494, in addition to £4,749 unexpended of the sum provided last half-year for reconstruction and maintenance.

Mexico Tramways Co., Ltd.—The directors have declared a dividend at the rate of 4 per cent. per annum for the three months ended June 30th.

Siemens Bros. & Co., Ltd.—This company's meeting was held in London on Monday. The directors' report recommended a dividend of 4 per cent. for the year; £3,500 was written off the value of shares held, and £1,116 is carried forward.

ELECTRIC TRAMWAY AND RAILWAY TRAFFIC RETURNS.

Locality.	Fortnight ended.	Receipts for the fortnight. £	Receipts for the fortnight. £*	No. of wks.	Total to date. £	Total to date. £*	Route miles open.	Inc.
Aberdeen	July 8	3,060	+ 3	6	8,240	— 175	14·4	..
Ayr	,, 11	718	— 79	8	2,628	— 111	8	..
Bath	,, 11	1,725	+ 105	27	18,679	— 1,304	13	..
†Belfast	,, 8	3,961	+ 123	14	50,465	+ 703	87	..
Birkenhead	,, 12	2,298	+ 56	15	16,046	+ 788	13·52	..
Birmingham Corp.	,, 4	12,727	+ 554	14	87,878	+ 4,585	56·46	..
Blackburn	,, 8	2,436	+ 272	15	17,726	+ 1,064	14·25	..
Blackpool Corp.	,, 9	3,523	+ 564	..	14,932	+ 1,267	11·67	..
† ,, —Fleetw'd.	,, 11	880	— 64	..	..	..	8·25	..
Bolton	,, 12	4,878	+ 293	15	35 696	+ 1,772	26	..
Bournemouth	June 10	3,567	+ 504	10	14,710	— 1,204	21·5	..
Bradford	July 4	10,228	+ 932	14	65,878	+ 1,181	54·9	1
Brighton	,, 12	1,962	+ 18	15	13,110	+ 203	9·5	..
Bristol	,, 10	13,321	+2,741	..	..	..	12·21	..
Brit. Elec. Trac. Co.								
Airdrie	,, 3	479	+ 19	26	5,875	+ 73	8·65	..
Barnsley	,, 3	359	+ 49	,,	4,541	+ 288	..	..
Barrow	,, 3	584	— 6	,,	6,142	— 59	5·87	..
Cavehill	,, 3	259	+ 108	,,	2,272	+ 281	..	..
Devonport	,, 3	1,046	+ 94	,,	11,728	+ 104	8·85	..
Gateshead	,, 3	2,826	+ 107	,,	26,264	+ 302	11·25	..
Gravesend	,, 3	491	— 24	,,	5,322	— 788	6·5	..
Greenock	,, 3	1,441	— 153	,,	13,560	— 3,462	7·25	..
Hartlepool	,, 3	558	— 100	,,	5,893	— 1,159	6·72	..
Kidderminster	,, 3	276	— 14	,,	2,676	— 132	..	..
Leamington	,, 3	405	+ 81	,,	4,056	+ 216	8	..
Merthyr	,, 3	411	— 12	,,	5,438	+ 63	2·9	..
Metropolitan	,, 3	13,458	+3,494	,,	142,629	+29,397	22	..
Middleton	,, 3	904	+ 184	,,	9,311	+ 415	6·5	..
Mid. Joint Com'tee	,, 3	10,606	— 117	,,	148,968	— 186	..	..
Oldham—Ashton	,, 3	1.224	— 27	,,	15,491	+ 30	9·13	..
Peterborough	,, 3	197	+ 37	,,	3,086	+ 76	5·31	..
Potteries	,, 3	3.683	— 274	,,	47,685	— 361	29	..
Rothesay	,, 3	379	+ 213	,,	3,418	+ 35	2·75	..
Southport	,, 3	766	— 77	,,	6,822	— 250	8·17	..
S. Metropolitan	,, 3	1,937	+ 266	,,	20,068	+ 723	..	..
Swansea	,, 3	2,056	— 225	,,	23,597	+ 1,816	5·5	..
Tynemouth	,, 3	829	+ 72	,,	5,012	— 259	3·75	..
Weston-s-Mare	,, 1	440	+ 90	,,	2,098	+ 4	8	..
‡Worcester	,, 3	657	+ 35	,,	6,929	+ 46	5·75	..
Wrexham	,, 3	222	+ 9	,,	2,598	+ 19	..	..
Yorks. Wool. Dist.	,, 3	1,967	— 71	,,	23,718	— 875	17	..
Miscellaneous	,, 3	521	+ 1	,,	5,168	— 410	..	..
Burnley	,, 11	2,651	+ 123	..	..	..	7·5	..
Burton-on-Trent	,, 12	573	— 14	15	4,088	— 252	10	..
Bury	,, 5	2,569	+ 284	13⅔	16,995	+ 1,835	10·5	..
Carlisle	,, 11	438	— 7	28	4,632	+ 23	..	..
Chatham and Dist.	,, 9	1,762	+ 126	27	19,713	+ 653	14·37	1·53
Cork	,, 9	1,161	— 4	27	12,065	— 891	9·89	..
Croydon	,, 10	3,080	+ 94	15	21,634	+ 260	11 25	..
Darlington	,, 11	407	— 21	15	2,969	— 208	..	..
Darwen	,, 10	558	+ 32	14	3,817	— 22	4·36	..
Dover	,, 4	472	..	14	2,916	— 186	4·75	..
Dublin	,, 10	12,469	+2,212	..	8,376	+ 1,365	54·25	5·5
Dundee	,, 8	2,510	+ 234	7⅔	9,590	+ 815	14·5	..
East Ham	,, 11	1,842	— 66	15	12,829	— 673	7·75	..
Glasgow	,, 11	35,276	+ 586	6	106,018	+ 1,899	89·25	1
Hastings	,, 13	2,268	+ 57	..	..	..	..	..
Huddersfield	,, 11	3,250	+ 113	15	21,247	+ 798	28·5	·5
Hull	,, 11	4,895	— 37	15	35,576	— 142	13	..
Ilkeston	,, 8	293	+ 15	14	2,022	+ 51	3·5	..
Ipswich	,, 11	900	— 1	15	5,800	— 25	10·5	..
Kilmarnock	,, 4	314	+ 2	7	1,117	— 89	4·25	..
†Lan'kshire Trm Co.	,, 2	1 446	+ 128	26	33,681	+ 3,941	15·82	..
Lancashire United	,, 8	3,202	+ 587	27	35,231	+ 2,130	39	1
Leeds	,, 4	14,571	+1,056	14	91,332	+ 2,851	96	6·5
Leicester	,, 11	4,657	+ 251	..	..	..	..	..
Leith	,, 4	1,211	+ 77	7⅔	4,004	— 26	6	..
Liverpool	,, 4	22,836	+ 898	27	284,159	— 1,467	104	..
‡L.C.C.	June 27	73,085	+8,517	12⅔	434,967	+46,643	119·5	6
London United	July 11	15,766	+ 454	..	174,757	+ 4,019	..	..
Lowestoft	,, 11	469	— 11	41	6,844	+ 150	3·5	..
†Manchester	,, 4	16,439	+1,497	14	209,747	+10,735	86	11
Newcastle	,, 11	8,954	—1,033	15	59,249	— 3,770	..	..
Newport	,, 4	1,402	+ 94	14	9,491	— 795	14·5	..
Northampton	,, 10	1,001	+ 105	14⅔	6,990	+ 454	5·5	..
Oldham	,, 12	3 879	+ 35	16	31,347	+ 711	23·75	..
†Pontypridd	,, 4	328	+ 68	14	4,934	+ 1,202	5	1·75
Portsmouth	,, 11	4,504	+ 160	15	29,587	+ 288	14·5	..
Preston	,, 8	1,579	+ 3	..	..	..	..	..
†Reading	,, 2	676	+ 66	13⅔	8,353	+ 156	13·25	..
Rotherham	,, 9	1,228	+ 29	14⅔	8,858	+ 198	10	·66
Salford	,, 6	10,149	+ 733	14	67,055	+ 870	38·9	..
Sheffield	,, 12	11,369	+ 196	12⅔	88,357	+ 263	36·25	·5
Southampton	,, 8	2,302	+ 182	14	15,440	+ 1,274	..	..
Southend-on-Sea	,, 8	996	+ 107	15	5,736	+ 418	..	..
Sunderland	June 28	2,526	— 773	13	15,009	— 3,369	..	..
Swindon	July 1	295	— 32	..	..	..	4·4	..
Tyneside	,, 8	1,157	+ 55	28	11,986	— 1,836	8·87	..
Wallasey	,, 11	1,944	+ 178	14⅓	13,251	+ 795	8·72	·22
Walthamstow	June 13	1,635	+ 427	11	7,049	+ 757	9	..
West Ham	July 2	4,763	— 80	14	31,483	— 1,768	14·7	..
Wolverhampton	,, 8	1,760	+ 1	14	12,341	— 66	12·5	..
Baker St.-Waterloo	,, 11	6,060	+ 660	..	..	..	4·25	1
Cen. London Rly.	,, 11	14.228	+2,789	..	..	..	5·77	..
Char. +, Eus. Hamp.	,, 11	6,685	+1,240	..	..	..	7·76	..
City & S. Lon. Rly.	,, 12	6,287	+ 159	..	..	..	7·6	1·05
†Dublin-Lucan Rly.	,, 10	148	+ 4	..	..	..	7	..
G.N. and City Rly.	,, 11	2,398	+ 542	..	..	..	3·5	..
G.N., P'dy. & Brmtn.	,, 11	10,670	+1,325	..	..	..	9·25	·25
L'pool Overh'd Rly.	,, 12	2,904	— 313	..	..	..	6·8	4·8
Mersey Railway	,, 11	5,685	— 206	..	..	..	4·5	..
Metropolitan Rly.	,, 12	23,483	+ 131	..	..	..	24·6	..
Met. District Rly.	,, 11	18,500	+1,973	..	..	..	24	..
Anglo-Argentine	,, 6	40,820	+4,529	27	601,821	+55,739	48	..
§Auckland	June 29	11,063	+ 926	24	70,669	+ 7,131	20·92	1·72
Bombay (B.E.T.)	,, 13	4,836	+1,207	24	33,187	+11,799	..	..
§Brisbane	,, 30	13,360	+ 860	..	..	..	..	..
†Buenos A. & Belgr'o.	July 1	3,654	+ 507	26	98,675	+ 1,116	..	..
Calcutta	,, 11	6,041	— 293	..	..	..	..	..
§Cape Electric T. Ld.	May	12,552	..	..	..	..	..	..
§Geneva	,,	9,120	+ 741	..	..	..	..	..
§Kalgoorlie, W.A.	,,	9,989	..	21	18,979	..	20·5	..
Madras	June 30	1,110	+ 68	26	15,068	+ 1,490	12·75	..
Montevideo	June	16,519	+2,397	22	160,490	+24,453	..	..
†Perth (W.A.)	July 10	2,709	+ 175	28	89,066	— 746	25·48	..

Compared with the corresponding period of 1907. † One week only. ‡ Includes horse, steam and other receipts. § One month.

STOCKS AND SHARES.

Tuesday Evening.

WITH money cheap and likely to become still cheaper, it is rather surprising that the markets are so slow to respond to the abundance of capital. Apparently the public prefer to allow money to remain on deposit with the banks at 1 per cent. instead of investing it in securities which pay more profitable rates. New issues have, no doubt, taken up a good deal of floating cash, but cannot be held accountable for all the lack of confidence which is still a feature of the financial world.

The end of the first half-year of 1908 has brought no relief to the wearied proprietors of Home Railway stocks. Prices continue to fall away in disheartening fashion, and the new six months have provided little comfort, so far, for stockholders. As regards electrical railways, however, the showing is generally satisfactory for the earlier half of the year. Only the Great Northern and City and the North London Companies show traffic decreases, and the figures of the other undertakings come out well. The statistics are clearly set forth by the *Economist* as follows, but we should point out that the North London is, unfortunately, not yet electrified:—

Half-year ended June—	1907.	1908.	Increase or decrease.
Baker Street and Waterloo	£62,241	£79,410	+ £17,169
Central London	157,239	162,503	+ 5,264
Charing Cross, Euston, &c.	—	84,460	—
City and South London	78,100	83,675	+ 5,575
Great Northern and City	47,206	43,783	— 3,423
Great North., Piccadilly, &c.	102,669	141,130	+ 38,461
Metropolitan	398,231	402,709	+ 4,478
District	207,633	233,034	+ 25,401
North London	231,869	204,269	— 27,600
	£1,285,188	£1,434,973	+ £149,785

Bakerloo 4 per cent. Debenture stock has hardened to 91, and the price carries the dividend, which will be deducted immediately. Therefore the yield to a buyer at the present price is 4½ per cent. The Debenture stock of the Piccadilly Tube, which is doing best of all the Underground group, stands at 90½, the price being *ex* dividend at the end of last month.

City and South London Ordinary stock slumped to 36, upon the declaration of a dividend at the rate of 1½ per cent., which is 1 per cent. less than that of a year ago. This result is certainly disappointing, and it would appear as though the company had not yet felt the full benefit of the latest extension. The traffic increase of £5,575 has been more than swallowed up by increased working charges and the additional capital ranking for dividend.

The weakness of Central Londons is explained by the fact of the traffics being less brilliant than expectation had locked for after the opening of the new Exhibition, and the only hope for the hapless North London would appear to lie in the proposed absorption by the London and North-Western.

Electricity Supply shares have lost most of their animation, but prices are well maintained. Kensingtons keep at 8½, and the list shows a few small rises. Charing Cross shares are somewhat dull. Three lots of Newcastle-on-Tyne Ordinary shares are now quoted, the old and fully-paid new shares being 5⅞, while the new £2 paid shares are about 10s. premium. The latest issue of Preference, also with £2 paid, are called 2⅜ middle. Indian Electric Supply 6 per cent. Debenture fell 5 points to 50, but St. James's 3½ per cent. Debenture moved up 2 per cent. to 89.

National Telephone stocks have again improved, the company's report being an exceedingly good one. The income for the past six months fell less than £50,000 short of the round million and a half sterling, and the net profit of £480,641 shows an increase of £40,700. While the Deferred dividend rests at 6 per cent., the reserve fund and the carry forward are both augmented. The United River Plate Telephone Company has also issued its report this week, and the declaration of a final dividend of 5 per cent. caused the Ordinary shares to gain half a crown. Chili Telephones at 7⅞ are 5s. better, while Orientals, on the other hand, have given way a trifle.

Weakness in the American group is almost the only feature amongst Telegraph securities. Anglo-American Preferred has again crumbled, and Direct United States Ordinary went ½ lower. Anglo Deferred has been moving erratically, its fluctuations governed to some extent by movements in the American Railroad market. Eastern and Western Telegraphs are very quiet, with quotations practically unaltered.

Marconi shares exhibit no recovery after their drop, the price continuing about 7s. 6d., and the market being a weak one.

Globe Telegraph Ordinary shares have come into request, and it will be noticed that the quotations for Mackay Common and Preferred shares have been materially narrowed.

Electric Construction Preference rose 5s., and the Debenture stock 4 points, upon the issue of a report which is distinctly good. The Preference dividend is to be paid up to the end of May last year, which will leave only 12 months' interest in arrear. British Aluminium Ordinary weakened to 2⅜, but recovered to 3, and the prior-charge securities have advanced. Up to to-night, Tuesday, the allotment letters for the new Debentures have not been received by applicants. Nominally the price of the new stock is a small discount. British Insulated Ordinary and Preference are strong, and Willans Preference show ½ rise.

Tramway and traction issues are so quiet as to call for no detailed comment.

SHARE LIST OF ELECTRICAL COMPANIES.

TELEGRAPH AND TELEPHONE COMPANIES.

Present Issue.	NAME.	Stock or Share.	Dividends for the last four years. 1904.	1905.	1906.	1907.	Closing Quotations July 7th.	Closing Quotations July 14th.	Business done week ended July 14th, 1908. Highest.	Lowest.	Rise + or Fall —	Present Yield per cent. £ s. d.
25,000	Amazon Telegraph Co.'s shares, Nos. 1 to 25,000	10	Nil	Nil	Nil	Nil	2 — 3	2 — 3	..	..	..	Nil
143,800	Do. do. 5 % Debs., Nos. 1 to 1,250 Red.	100	Nil	5 %	5 %	5 %	85 — 88	86 — 89	88½	..	+1	5 12 4
$131,551,400	American Telephone & Telegraph, Cap. Stock ..	$100	7¼%	7¼%	8 %	8 %	120 —124	120 —124	..	..	..	6 8 9
53,000,000	Do. Collat. Trust, 4% Bonds, 1 to 28,000 and 53,001 to 78,000	$1000	4 %	4 %	4 %	4 %	89 — 92 xd	89 — 92	..	..	..	4 7 0
598,180	Anglo-American Telegraph	Stock	3¾%	3¾%	3¾%	3¼%	58 — 61	58 — 61	..	..	..	5 14 9
3,200,910	Do. do. do. 6 % Pref.	Stock	5¾%	6 %	6 %	6 %	102½—103½	102 —103	103½	102	— ½	5 16 6
3,200,910	Do. do. do. Deferred	Stock	Nil	¾%	1¾%	1 %	15½— 16	15½— 16½	16½	15¾	+ ½	6 3 1
50,000	Anglo-Portuguese Tel., 5 % Mort. Deb. Stock Red.	100	..	5 %	5 %	5 %	99 —102	99 —102	..	..	..	4 18 0
44,000	Chili Telephone, Nos. 1 to 44,000	5	8 %	8 %	8 %	..	7½— 7¾	7½— 8	7½	..	+ ¼	5 0 0
2,888,376	Commercial Cable Sting. 500 year 4 % Deb. Stk. Red.	Stock	4 %	4 %	4 %	4 %	83 — 86	83 — 86	..	..	..	4 13 0
16,000	Cuba Telegraph	10	5 %	5 %	5 %	..	7½— 8½	7½— 8½	..	..	..	5 17 8
6,000	Do. 10 % Pref.	10	10 %	10 %	10 %	10 %	15½— 16½	15½— 16¼	..	..	..	5 19 5
12,981	Direct Spanish Telegraph, Ord.	5	4 %	4 %	4 %	4 %	3 — 3½	3 — 3½	..	..	..	6 8 1
6,000	Do. do. 10 % Cum. Pref. ..	5	10 %	10 %	10 %	10 %	8 — 9	8 — 9	8½	..	..	5 11 1
30,000	Do. do. 4½ % Debs.	100	4½%	4½%	4½%	4½%	100 —103	100—103	..	..	..	8 14 10
60,710	Direct United States Cable	20	3½%	4½%	4½%	..	13½—14½	13¾—14	13¾	..	— ½	6 12 2
50,900	Direct W. India Cable, 4½ % Reg. Deb., 1 to 1,200, R.	100	4½%	4½%	4½%	4½%	98 —100	98 —100	..	..	..	4 10 0
4,000,000	Eastern Telegraph, Ord. Stock	Stock	7 %	7 %	7 %	7 %	133 —136	133 —136	135	133	..	5 2 11
2,000,000	Do. 5½ % Pref. Stock	100	5½%	5½%	5½%	5½%	84½— 86½	84½— 86½	85½	85½	..	4 0 11
1,896,706	Do. 4 % Mort. Deb. Stock. Red. ..	Stock	4 %	4 %	4 %	4 %	101 —103	101 —103	102½	101½	..	3 17 8
960,000	Eastern Extension, Australasia, and China Tele.	10	7 %	7 %	7 %	7 %	12½— 13½	12½— 13½	13½	12½	..	5 5 8
752,400	Do. 4 % Deb. Stock	Stock	4 %	4 %	4 %	4 %	100½—102½	100½—102½	102	101½	..	3 18 1
269,700	East & S. Afric. Tel., 4 % Mt. Db., 1 to 3,000, red. 1909	100	4 %	4 %	4 %	4 %	101 —103	100 —102	..	..	—1	3 18 5
200,000	Do. 4 % Reg. M. Debs. (Mauritius Sub.) 1 to 8,000	25	4 %	4 %	4 %	4 %	100 —102	100 —102	..	..	..	3 18 5
181,127	Globe Telegraph and Trust	10	5⅝%	5½%	5½%	5½%	10¾— 10¾	10½— 11	10¾	10⅝	+ ⅛	5 7 11
181,127	Do. do. 6 % Pref.	10	6 %	6 %	6 %	6 %	13⅝— 14⅛	13⅝— 14⅛	13¾	13⅝	..	4 4 11
150,000	Great Northern Telegraph, of Copenhagen.. ..	10	24 %	24%	20 %	20 %	27 — 29 xd	27 — 29	28½	..	..	6 17 11
19,600	Halifax and Bermudas Cable, 4½ % 1st Mort. Debs., within Nos. 1 to 1,200, Red.	100	4½%	4½%	4½%	4½%	98 —100	98 —100	..	..	..	4 10 0
17,000	Indo-European Telegraph	25	13 %	13 %	13 %	13 %	54 — 57	55 — 58	56	55½	+1	5 12 1
$41,380,400	Mackay Companies Common	$100	1 %	2 %	3½%	4 %	60 — 70	64 — 68	..	..	+1	5 17 8
$50,000,000	Do. do. 4% Cum. Pref.	$100	4 %	4 %	4 %	4 %	60 — 70	64 — 68	..	..	+1	5 17 8
384,190	Marconi's Wireless Telegraph	1	Nil	Nil	Nil	Nil	⅝— ⅞	⅝— ⅞	..	..	..	Nil
72,680	Monte Video Telephone Co., Ltd. Ord.	1	4 %	5 %	6 %	6 %	1⅝— 1¾	1⅝— 1¾	20/-	19/9	..	4 14 1
86,492	Do. do. do. 5 % Pref. ..	1	5 %	5 %	5 %	5 %	1⅞— 2	1⅞— 1⅞	17.9	..	— 1/32	5 6 8
2,225,000	National Telephone, Pref. Stock	100	6 %	6 %	6 %	6 %	108½—110½	109 —111	110½	109	+ ½	5 8 1
3,725,000	Do. do. Def. Stock	100	5 %	5 %	5 %	6 %	115 —117	115½—117½	117	115½	+ ½	5 2 2
15,000	Do. do. 6 % Cum. 1st. Pref.	10	6 %	6 %	6 %	6 %	10½— 12½	10¾— 12¾	..	..	..	4 16 0
15,000	Do. do. 6 % Cum. 2nd Pref.	10	6 %	6 %	5 %	5 %	10½— 12½	10¾— 12¾	..	..	..	4 0 0
250,000	Do. do. 5 % Non-cum. 3rd P., 1 to 250,000	5	5 %	5 %	5 %	5 %	5⅝— 5⅞	5⅝— 5⅞	5 5/16	5 7/16	..	4 8 11
2,000,000	Do. do. 3½ % Deb. Stock Red. ..	Stock	3½%	3½%	3½%	3½%	98 —100	98 —100	98½	98	..	3 10 0
1,716,598	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	100½—102½	100½—102½	101½	101½	..	3 18 1
179,313	Oriental Telep. and Elec. 1 to 171,504, fully paid ..	1	6¾%	7 %	7 %	8 %	1½— 1⅝	1 7/16— 1 9/16	..	..	— 1/16	6 1 11
50,000	Do. do. 6 % Cum. Pref.	1	6 %	6 %	6 %	6 %	1⅛— 1¼	1⅛— 1¼	..	..	..	4 16 0
99,100	Do. do. do. 4 % Red. Deb. Stock ..	100	..	4 %	4 %	4 %	88 — 91	88 — 91	..	..	..	4 7 11
99,400	Pacific & European Tel., 4 % Guar. Debs., 1 to 1,000	10	4 %	4 %	4 %	4 %	97 —100	97 —100	..	..	..	4 0 0
11,832	Reuter's	8	5 %	5 %	5 %	5 %	7¾— 8¼	7¾— 8¼	..	..	..	4 14 1
99,100	Telephone Co. of Egypt, 4½ % Deb. Red.	100	..	4½%	4½%	4½%	97 —100	98 —101	..	..	+1	4 9 1
3,083	Submarine Cables Trust	Cert.	6 %	6 %	6 %	6 %	127 —130	127 —130	..	..	..	4 12 4
100,000	United River Plate Telephone	5	8 %	8 %	8 %	8 %	6⅜— 6⅞	6¼— 7	..	..	+ 1/16	5 14 3
40,000	Do. 5 % Cum. Pref., Nos. 1 to 40,000	5	5 %	5 %	5 %	5 %	5 — 5¼	5 — 5¼	..	..	..	4 15 8
30,008	W. Coast of America, 1 to 30,000 & 53,001 to 53,008	2	Nil	Nil	2½%	..	1⅛— 1 7/16	1⅛— 1 7/16	..	..	..	3 10 2
150,000	Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel.	100	4 %	4 %	4 %	4 %	98 —101 xd	98 —101	..	..	..	3 19 3
207,980	Western Telegraph, Ltd., Nos. 1 to 207,980.. ..	10	7 %	7 %	7 %	..	13½— 14	13½— 14	13⅞	13⅝	..	5 0 0
800,000	Do. do. 4 % Deb. Stock Red. ..	100	4 %	4 %	4 %	4 %	99½—101½	99½—101½	99½	..	..	3 18 10
88,321	West India and Panama Telegraph	10	Nil	Nil	Nil	Nil	⅜— ⅝	⅜— ⅝	..	..	..	Nil
34,558	Do. do. 6 % Cum. 1st Pref.	10	6 %	5 %	8 %	6 %	8½— 8¾	8 — 8½	8 5/16	8¼	— ½	7 1 2
4,669	Do. do. 6 % Cum. 2nd Pref.	10	Nil	Nil	Nil	£2 6 0	8½— 9½	8½— 9½	..	..	..	2 9 0
80,000	D do. 5 % Debs., Nos. 1 to 1,800 ..	100	5 %	5 %	5 %	5 %	99 —102	99 —102	..	..	..	4 18 0

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.

390,000	Anglo-Argentine Trams, 10 % Nom. Cum. 2nd Pref., 260,008 to 580,007	5	8 %	8 %	8 %	9 %	8 7/16— 8 1/16	8 7/16— 8 1/16	8⅝	8 15/16	..	5 4 4
260,007	Do. 6 % Cum. Prefs., 1 to 260,007 ..	5	5¾%	5¾%	5¾%	5¾%	6⅛— 6⅜	6¼— 6⅜	6 5/16	6 1/16	..	4 10 2
366,600	Do. Permanent, 6 % Deb. Stock, 1888	100	6 %	6 %	6 %	6 %	138 —143	139 —144	143	..	+1	4 3 4
285,100	Auckland E. Trams, 5 % 1st Mort. Deb. Stock ..	100	5 %	5 %	5 %	5 %	103 —106	103 —106	..	..	..	4 14 4
880,000	Babcock & Wilcox, 1 to 580,000..	1	20 %	20 %	20 %	20 %	3 1/32— 4 1/32	3 1/32— 4 1/32	80/-	77/6	..	5 0 0
100,000	Do. do. 6 % Cum. Pref., 1 to 100,000 ..	1	6 %	6 %	6 %	6 %	1 1/16— 1 1/8	1 1/16— 1 1/8	..	..	..	3 16 10
40,000	British Aluminium, Ord., 1 to 40,000	5	7 %	7 %	7 %	7 %	3 — 3½	2 15/16— 3¼	50/-	..	— ½	10 15 4
40,000	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	7 %	4 — 4½	4 — 4½	..	..	..	7 15 7
20,000	Do. do. "A" 6 % Cum. Pref.	5	6 %	6 %	6 %	6 %	4½— 5½	4½— 5½	..	..	..	5 14 3
20,000	Do. do. 4 % Funding Certs.	5	4 %	4 %	4 %	4 %	3½— 4½	3½— 4½	..	..	..	4 14 1
238,200	Do. do. 5 % 1st Mort. Deb. Stock Red.	Stock	5 %	5 %	5 %	5 %	106 —110	106 —110	..	..	..	4 10 11
800,000	Do. do. 5½ % Loch Leven Debs. ..	100	..	..	5½%	5½%	99 —102	99 —102	..	..	..	5 7 10
400,000	British Columbia E. Rail Def. Ord. Stock ..	100	6 %	6 %	6 %	8 %	125 —130	124 —129	..	..	+1	6 4 0
800,000	Do. 5 % Pref. Ord. Stock	100	5 %	5 %	5 %	5 %	108 —112	108 —112	..	..	..	4 9 3
800,000	Do. 5 % Cum. Perp. Pref. Stock ..	100	5 %	5 %	5 %	5 %	107 —111	107 —111	..	..	..	4 10 1
283,000	Do. 4½ % 1st Mort. Debs., 1 to 6,250 ..	40	4½%	4½%	4½%	4½%	99 —102	99 —102	..	..	..	4 8 3
220,000	Do. 4½ % Vancouver Power Debs., 1 to 2,200	100	4½%	4½%	4½%	4½%	101 —104	101 —104	..	..	..	4 6 2
183,301	British Electric Traction	10	6 %	3 %	Nil	Nil	1⅜— 1⅞	1⅜— 1⅞	32/6	31/3	..	Nil
161,437	Do. do. 6 % Cum. Pref.	10	6 %	6 %	6 %	3 %	4½— 4¾	4½— 4¾	88/9	..	..	6 6 4
1,473,653	Do. do. 5 % Perp. Deb. Stock ..	Stock	5 %	5 %	5 %	5 %	94 — 97	95 — 98	96½	95½	+1	5 2 0
528,936	Do. do. 4½ % 2nd Deb. Stock Red.	100	4½%	4½%	4½%	4½%	76 — 78	76 — 78	..	..	..	5 14 3
100,000	British Insulated and Helsby Cables	5	8 %	8 %	10 %	..	6 — 6¼	6 — 6¼	..	..	..	3 8 7
100,000	Do. do. 6 % Cum. Pref.	5	6 %	6 %	6 %	6 %	6 — 6½	6 — 6¼	..	..	..	4 16 0
500,000	Do. do. 4½ % 1st Mort. Deb. Stock.	100	4½%	4½%	4½%	4½%	100 —103	100 —103	..	..	..	4 7 5
212,000	British Thomson-Houston 4½ % 1st Mort. Debs. ..	100	4½%	4½%	4½%	4½%	93 — 98	93 — 98	..	..	..	4 11 10
400,000	British Westinghouse 6 % Pref., 1 to 200,000 and 275,001 to 475,000	5	Nil	Nil	Nil	Nil	7/16— 11/16	7/16— 1/2	..	..	..	Nil
1,016,858	Do. do. 4 % Mort. Deb. Stock ..	100	4 %	4 %	4 %	4 %	43 — 48	43 — 48	45	44	..	8 6 8
50,000	‡Browett, Lindley & Co., Ord.	1	Nil	Nil	Nil	Nil	5/8— 11/16	5/8— 11/16	..	..	..	Nil
50,000	‡ Do. do. 6 % Cum. Pref.	1	Nil	Nil	Nil	Nil	14/6 to 15/6	14/6 to 15/6	..	..	..	Nil
105,731	Brush Electrical Engineering, Ord., 1 to 105,731 ..	2	Nil	2½%	Nil	Nil	0 — ¼	0— ¼	..	..	..	Nil
150,000	Do. do. Non-cum. 6 % Pref.	2	6 %	6 %	Nil	Nil	3/16— 1/8	3/16— 1/8	..	..	..	Nil
125,000	Do. do. 4½ % Perp. Deb. Stock ..	Stock	4½%	4½%	4½%	4½%	70 — 75	70 — 75	..	..	..	6 0 0
125,000	Do. do. 4½ % Perp. 2nd Deb. Stock..	Stock	4½%	4½%	4½%	4½%	53 — 58	53 — 58	..	..	..	7 15 2
100,000	Buenos Ayres & Belgrano, 1 to 100,000	5	4 %	3 %	3 %	..	..	..	..	..	..	3 1 6
40,000	Do. do. "A" 6 % Cum. Pref., 1 to 40,000	5	6 %	6 %	6 %	6 %	..	..	..	..	..	5 17 1
27,500	Do. do. "B" do., 1 to 27,500	5	6 %	6 %	6 %	6 %	..	..	..	..	..	5 17 1
136,400	Do. do. 5 % Deb. Stock	100	5 %	5 %	5 %	5 %	..	..	..	..	..	4 6 2
190,000	Do. do. 5 % 2nd Deb. Stock	100	5 %	5 %	5 %	5 %	..	..	..	..	..	4 15 8
127,610	Calcutta Trams, 1 to 127,610	5	8 %	8 %	8 %	6 %	5⅝— 6⅜	5¾— 6	6 1/16	..	— ½	5 0 0
30,000	Do. 5 % Cum. Pref., Nos. 1 to 29,380..	5	..	5 %	5 %	5 %	5 — 5⅜	5 — 5⅜	..	..	..	4 13 0
850,000	Do. 4½ % 1st Deb. Stock..	100	4½%	4½%	4½%	4½%	101 —104	101 —104	..	..	..	4 6 7
85,000	Callender's Cable Construction shares	5	12½%	15 %	15 %	15 %	9½— 10½	9½— 10½	9⅝	..	..	7 2 10
40,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	5 %	5½— 5¾	5½— 5¾	..	..	..	4 5 11
800,000	Do. do. 4½ % 1st Mort. Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	105 —107	105 —107	..	..	..	4 4 1
491,222	Cape E Trams., 1 to 491,222	1	5 %	Nil	Nil	Nil	3/16— 7/16	3/16— 7/16	..	..	..	Nil
450,000	Castner-Kellner Alkali, 1 to 450,000	1	4 %	6 %	8 %	12 %	1⅛— 1⅜	1 7/16— 1 9/16	26/9	..	+ 1/16	8 7 0
215,045	Do. do. 4½ % 1st Mort. Deb. Stock	100	4½%	4½%	4½%	4½%	101 —104	102 —105	..	..	+1	4 5 9
1,898,610	Central London Railway, Ord. Stock..	Stock	4 %	4 %	4 %	3 %	75 — 78	72 — 75	78½	72	—3	4 0 0
658,195	Do. do. 4 % Pref. Stock	Stock	4 %	4 %	4 %	4 %	90 — 92	88 — 90	90	80	—2	4 8 11
658,195	Do. do. Def. do.	Stock	4 %	4 %	4 %	2 %	55 — 58	54 — 57	..	..	—1	3 10 2
1,490,000	City and South London Railway	Stock	2¾%	1¾%	2¾%	2¾%	38 — 40	35 — 37	39	37	—3	5 14 10

Unless otherwise stated, all shares are fully paid. † A period of nine months. ‡ From Manchester Share List.

Continued on next page

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.—(*Continued*)

Present Issue.	NAME.	Stock or Share.	Dividends for the last four years. 1904.	1905.	1906.	1907.	Closing Quotations July 7th.	Closing Quotations July 14th.	Business done week ended July 14th, 1908. Highest	Lowest.	Rise + or Fall —	Present Yield per cent. £ s. d
85,000	Crompton & Co., Nos. 1 to 85,000	* 8	2½%	2½%	5 %	5 %	1⅝— 1⅞	1⅝— 1⅞	..	..	..	8 0 0
100,000‡	Do. 5 % 1st Mort. Reg. Debs., 1 to 900 of £100, and 901 to 11,000 of £50 Red.	..	5 %	5 %	5 %	5 %	90 — 93 xd	90 — 93	..	..	..	5 5 11
260,000	Dick, Kerr & Co., 1 to 260,000	1	10 %	10 %	10 %	10 %	1⅛— 1⅜	1⅛— 1⅜	..	..	..	7 5 5
805,000	Do. do. 6 % Cum. Pref., 1 to 805,000	1	6 %	6 %	6 %	6 %	1 — 1⅛	1 — 1⅛	..	..	..	4 16 0
282,580	Do. dc. 4½ % Deb. Stock	100	4½%	4½%	4½%	4½%	99 —102	99 —102	..	..	..	4 8 3
60,000	Dublin United Trams. (1896), 1 to 60,000	10	6 %	6%	6 %	6¾%	12½— 13½	12½— 13½	..	..	..	4 18 2
59,987	Do. 6 % Pref. between 1 and 60,000	10	6 %	6 %	6 %	6 %	12½— 13½	12½— 13½	13/-	12/6	..	4 7 3
99,261	Edison & Swan Utd., "A" shs., £3 pd., 1 to 99,261	5	2½%	4½%	4½%	4½%	¼— ⅜	¼— ⅜	..	..	..	16 15 0
17,139	Do. "A" shares, 01—017,139	5	2½%	4½%	4½%	4½%	¼— ⅜	¼— ⅜	..	..	..	16 15 0
319,475	Do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	1⅝— 2⅛	1⅝— 2⅛	..	..	..	8 6 9
72,220	Do. 5 % 2nd Deb. Stock Prov. Certs. all pd.	100	5 %	5 %	5 %	5 %	76 — 79	76 — 79	..	..	..	5 1 3
112,100	Electric Construction, 1 to 112,100	2	4 %	Nil	Nil	Nil	85 — 87	85 — 87	..	..	..	5 14 11
81,890	Do. do. 7 % Cum. Pref., 1 to 81,890	2	7 %	7 %	7 %	Nil	¼— ⅜	¼— ⅜	..	..	..	Nil
25,000	General Electric Co. (1900), 5 % Cum. Pref.	10	5 %	5 %	5 %	5 %	1½— 1⅝	1½— 2	..	..	+ ⅛	Nil
200,000	Do. do 4 % Mort Deb.	Stock	4 %	4 %	4 %	4 %	7½— 8	7½— 8	..	..	..	6 5 0
78,000	Gt. N. & City Rail. Pref. Ord. "A" 4 %, 1 to 78,000	10	4 %	4 %	4 %	¾%	87 — 90	87 — 90	..	..	..	4 8 11
96,000	Greenwood & Batley, 7 % Cum. Pref.	10	7 %	7 %	7 %	..	⅜— 1½	⅜— 1½	..	..	..	3 6 8
80,000	Do. do. 5 % Mort. Debs.	100	5 %	5 %	5 %	..	10½— 10⅝	10½— 10⅝	..	..	..	6 10 8
40,000	Henley's (W. T.), Telegraph Works, Ord.	5	15 %	15%	15 %	15%	102 —108	102 —108	..	..	..	4 17 1
40,000	Do. do. 4½ % Pref.	5	4½%	4½%	4½%	4½%	10½— 11½	10½— 11½	..	..	..	8 18 10
150,000	Do. do. 4½ % Mort. Deb. Stock	Stock	4½%	4½%	4½%	4½%	5 — 5½	5 — 5½	5⅛	..	..	4 1 10
50,000	India-Rubber, Gutta-percha & Telegraph Works.	10	5 %	10%	10 %	..	105 — 107	105 — 107	..	..	..	4 4 1
37,500	†Liverpool Overhead Railway, Ord.	10	13½	Nil	Nil	⅛%	15⅛— 16⅛	15⅛— 16⅛	..	..	..	6 1 8
10,000	† Do. do. Pref., fully paid	10	5 %	5 %	5 %	5 %	1½— 1⅝	1½— 1⅝	..	..	— ⅛	3 14 1
600,070	London United Trams. (1901), 1 to 50,007	10	6 %	3 %	3 %	..	5½— 6½	5½— 6½	..	..	..	8 0 0
399,930	Do. do. 60,008 to 100,000	10	6 %	3 %	3 %	..	6½— 6⅝	6½— 6⅝	..	..	..	4 8 11
125,000	Do. do. 5 % Cum. Pref., 1 to 125,000	10	5 %	5 %	5 %	5 %	6½— 6⅝	6½— 6⅝	..	..	..	4 8 11
1,331,000	Do. do. 4 % 1st Mort. Deb. Stock	100	4 %	4 %	4 %	4 %	7 — 8	7 — 8	7½	..	..	6 5 0
5,732,062	Metropolitan Consolidated	100	3 %	23%	1 %	½%	79 — 84	79 — 84	79	78½	..	4 15 3
2,640,914	Do. Surplus Lands	100	23%	23%	23%	2½%	38½— 39½	36½— 37½	39½	37	—2	1 6 8
3,235,000	Do. District	100	Nil	Nil	Nil	Nil	68 — 70	68 — 70	69	68	..	3 18 7
314,016	Metropolitan Electric Trams., Defd.	1	Nil	Nil	Nil	..	12 — 13	11½— 12½	12¼	11½	— ⅛	Nil
500,000	Do. do. 5 % Cum. Pref.	1	5 %	5 %	5 %	5 %	1/16— 3/32	1/16— 3/32	..	..	..	Nil
350,000	Do. do. 4½ % Deb. Stock Red.	100	4½%	4½%	4½%	4½%	3/16— 5/32	3/16— 5/32	15/9	..	..	6 8 1
245,500	Potteries E. Trc.	1	5 %	4 %	4 %	4 %	93 — 96	93 — 96	94	93½	..	4 18 9
245,500	Do. 5 % Cum. Pref.	1	5 %	5 %	5 %	5 %	⅛— ¼	⅛— ¼	..	..	..	8 0 0
245,000	Do. 4½ % Deb. Stock	100	4½%	4½%	4½%	4½%	⅛— ¼	⅛— ¼	12/6	..	..	6 13 4
37,350	Telegraph Construction and Maintenance	12	15 %	15 %	15 %	17½%	93 — 96	93 — 96	..	..	..	4 18 9
150,000‡	Do. 4 % Deb. Bds., 1 to 1,500 Red., 1909	100	4 %	4 %	4 %	4 %	31 — 33	31 — 33	32	31	..	6 5 0
3,599,200	Undergd. E. R., Lon., 5 % Profit Shar. S. Nts.	..	5 %	5 %	5 %	5 %	100 —102 xd	100 —102	..	..	..	3 18 5
66,666	Willans & Robinson, 1 to 30,000 & 80,001 to 116,666	1	Nil	Nil	Nil	10 %	40 — 44	40 — 44	42	41⅞	..	11 7 4
66,666	Do. 6 % C.P., 30,001 to 80,000 & 125,001 to 141,666	5	Nil	Nil	..	6 %	⅜— 1½	⅜— 1½	..	..	..	8 0 0
46,404	Do. 4 % 1st Mort. Deb. Stock	100	4 %	4 %	4 %	4 %	8¼— 8¾	8¼— 8¾	..	..	+ ⅛	9 4 7
							72 — 76	72 — 76	..	..	..	5 5 3

ELECTRICITY SUPPLY COMPANIES.

15,000	Bromley (Kent) E.L. & P., 1 to 15,000	5	5½%	5½%	5½%	5½%	4¼— 5	4¼— 5	..	..	..	5 10 0
70,000	Do. do. 4½ % 1st. deb. stock	100	4½%	4½%	4½%	4½%	94 — 97	94 — 97	..	..	..	4 10 11
80,131	Brompton & Kens. Elec. Lt. Sup., Ord., 1 to 20,000	5	10 %	10 %	10%	10 %	7 — 8	7 — 8	..	..	..	6 5 0
9,869	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	7 %	6¾— 7¼	6¾— 7¼	..	..	..	4 10 4
836,876	Central Electric Supply 4 % Guar. Deb. Stock	100	4 %	4 %	4 %	4 %	98 — 101	98 —101	..	..	..	3 19 3
80,000	Charing Cross and Strand Electricity Supply	5	8 %	5 %	5 %	5 %	3⅜— 4⅛	3⅜— 4⅛	80/-	..	..	5 17 8
80,000	Do. do. do. 4½ % Cum. Pref.	5	4½%	4½%	4½%	4½%	4⅛— 4⅜	4 — 4⅜	85/-	82/6	— ⅛	5 0 0
80,000	Do. "City Undertaking" 4½ % Cum. Prf.	5	4½%	4½%	4½%	4½%	3⅞— 4⅛	3⅞— 4⅛	75/-	72/6	— ⅛	4 17 4
145,736	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	95 — 98	94 — 97	95½	..	—1	4 2 6
49,436	Chelsea Electricity Supply, Ord.	5	6 %	6 %	4½%	4½%	3 — 3⅛	3 — 3⅛	..	..	..	6 8 7
175,000‡	Do. do. 4½ % Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	99 —102	100 —103	..	..	+1	4 7 5
70,595	City of London Elec. Lighting, Ord. 40,001—110,595	10	6 %	6 %	6 %	6 %	9⅛— 10⅛	9⅛— 10⅛	10/-	..	..	5 14 3
40,000	Do. 6 % Cum. Pref., 1 to 40,000	10	6 %	6 %	6 %	6 %	12 — 13	12 — 13	12 11/16	12⅜	..	4 12 4
400,000‡	Do. 5 % Db. Stk., Scrip. (iss. at 115) all pd.	..	5 %	5 %	5 %	5 %	122 —125	122 —125	..	..	..	4 0 0
800,000	Do. 4½ % 2nd. Db. Stk., Prov. Crts., all pd.	100	4½%	4½%	4½%	4½%	100 —103	101 —104	103	..	+1	4 6 7
40,000	County of Durham Electrical Power, Ord.	5	£3 7 0	4 %	4 %	2 %	2⅜— 3	2⅜— 3	..	..	..	3 6 8
50,000	Do. do. do. 5 % Pref.	5	5 %	5 %	5 %	5 %	3½— 4⅛	3½— 4⅛	..	..	..	5 17 8
40,000	County of London Electric Lighting, Ord. 1—40,000	10	4½%	5 %	5 %	5 %	7⅜— 8⅛	7⅜— 8⅛	..	..	..	6 1 3
40,000	Do. do. 6 % Pref., 40,001—60,000	10	6 %	6 %	6 %	6 %	10⅜— 10⅝	10⅜— 10⅝	10 3/16	10⅛	..	5 9 1
400,000‡	Do. do. 4½ % Deb. Stock	..	4½%	4½%	4½%	4½%	105 —108	105 —108	..	..	..	4 3 4
400,000	Do. do. 4½ % 2nd. Deb. Stock	Stock	4½%	4½%	4½%	4½%	98 —101	98 —101	..	..	..	4 9 1
80,000	Edmundson's Electric Corporation, Ord. Shares	5	7 %	4 %	Nil	Nil	⅛— ¼	⅛— ¼	..	..	..	Nil
80,000	Do. do. 6 % Cum. Pref.	5	6 %	6 %	3 %	Nil	½— 1	½— 1	..	..	..	Nil
433,000	Do. do. 4½ % 1st Mort. Deb. Stk.	100	4½%	4½%	4½%	4½%	63 — 73	63 — 73	..	..	..	6 8 3
10,000	Folkestone, 1 to 10,000	5	5½%	5½%	5½%	5½%	4⅜— 5⅛	4⅜— 5⅛	..	..	..	5 4 9
10,000	Do. 5 % Cum. Pref., 1 to 10,000	5	..	5 %	5 %	5 %	5 — 5⅛	5 — 5⅛	..	..	..	4 10 11
90,000	Do. 4½ % 1st Deb. Stock	100	4½%	4½%	4½%	4½%	96 — 99	97 —100	..	..	+1	4 10 0
15,000	Hove, 1 to 15,000	5	8½%	9 %	9 %	8½%	6 — 6¼	6 — 6⅛	6 5/16	..	..	6 10 9
21,000	Kensington and Knightsbridge Electric Ord.	5	12 %	10 %	10 %	10 %	8 — 9	8 — 9	..	..	..	5 9 7
90,000	Do. do. do. 4 % Deben. Stk.	Stock	4 %	4 %	4 %	4 %	96 — 99	96 — 99	..	..	..	4 0 10
10,000	London Electric Supply Corporation, Limited, Ord.	3	3 %	4 %	4 %	2½%	⅞— 1⅛	⅞— 1⅛	..	..	..	5 8 1
70,000	Do. do. do 6 % Pref.	5	6 %	6 %	6 %	6 %	4½— 5	4½— 5	..	..	..	6 0 0
74,395	Do. do. 4 % 1st Mort. Deb. Stk. Red.	Stock	4 %	4 %	4 %	4½%	89 — 92	89 — 92	..	..	..	4 17 10
200,000	Metropolitan Electric Supply, 1 to 100,000	5	10 %	10 %	8 %	6¾%	4⅜— 5⅛	4⅜— 5⅛	..	..	..	5 15 7
76,121	Do. 4½ % Cum. Pref. 1—71,106	5	4½%	4½%	4½%	4½%	4⅜— 5⅛	4⅜— 4⅝	90/-	88/9	..	4 12 4
220,000‡	Do. 4½ % 1st Mort. Deben. Stock	..	4½%	4½%	4½%	4½%	105 —109	105 —109	..	..	..	4 2 7
250,000‡	Do. 3½ % Mort. Deben. Stock Redem.	Stock	3½%	3½%	3½%	3½%	84 — 89	84 — 89	88	..	..	3 18 8
250,000	Midland Electric Corporation, 4½ % 1st Mort. Deb.	100	4½%	4½%	4½%	4½%	94 — 97	94 — 97	..	..	..	4 12 9
87,500	Newcastle-on-Tyne, 1 to 87,500	5	8 %	8 %	8 %	8 %	5½— 6	5½— 6	..	..	..	6 13 4
87,500	Do. 5 % Pref., 1 to 87,500	5	5 %	5 %	5 %	5 %	5½— 5¾	5½— 5¾	..	..	..	4 3 4
10,852	Notting Hill Electric Lighting	10	7 %	7½%	7½%	7½%	12 — 13	12 — 13	..	..	..	5 15 5
20,000	Oxford, 1 to 96 and 407 to 20,310	5	7 %	7 %	7 %	7 %	5⅝— 6½	5⅝— 6½	..	..	..	5 12 0
50,000	Do. 4 % Deb. Stock	100	4 %	4 %	4 %	4 %	95 — 99	96 — 99	..	..	..	4 0 10
40,000	St. James' and Pall Mall Electric Light, Ord.	5	14½%	12½%	10 %	10 %	7¼— 8½	7¼— 8½	..	..	..	5 17 8
20,000	Do. do. 7 % Pref. 20,051 to 40,050	5	7 %	7 %	7 %	7 %	6¾— 7¼	6¾— 7¼	..	..	..	4 16 7
50,000‡	Do. do. 3½ % Deb. Stock Red.	100	3½%	3 %	3½%	3½%	83 — 88	86 — 90	..	..	+2½	3 17 9
12,000	Smithfield Markets Electric Supply, Ord.	5	4 %	4 %	Nil	Nil	⅛— ¼	⅛— ¼	..	..	..	Nil
50,000	Do. do. do. 4 % Deb. Stock	Stock	4 %	4 %	4 %	4 %	70 — 74	70 — 74	..	..	..	5 8 1
65,000	South London Electricity Supply, Ord.	5	4 %	4 %	3 %	4 %	2⅜— 2⅞	2⅜— 2⅞	..	..	..	6 19 2
20,000	South Met. Elec. Lt. & Power, Ord.	1	Nil	2½%	2½%	2½%	⅜— ½	⅜— ½	..	..	..	3 6 8
117,968	Do. do. 7 % Pref.	1	7 %	7 %	7 %	7 %	1 — 1⅛	1 — 1⅛	..	..	..	5 12 0
200,000	Do. do. 4½ % 1st Deb. Stk.	100	4½%	4½%	4½%	4½%	99 —102	99 —102	..	..	..	4 8 3
80,000	Urban Electric Supply, Ord.	5	5 %	5 %	5 %	5 %	1 — 2	1 — 2	..	..	..	12 10 0
50,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	5 %	1⅞— 2⅜	1⅞— 2⅜	..	..	..	10 10 6
200,000	Do. do. 4½ % 1st Mort. Db. Stk. Red.	100	4½%	4½%	4½%	4½%	87 — 90	87 — 90	..	..	..	5 0 0
110,000	Westminster Electric Supply, Ord.	5	14 %	13 %	12 %	10 %	7⅜— 8⅝	7⅜— 8⅝	..	..	..	5 14 3
81,279	Do. do. 4½ % Cum. Pref. (Original 5 %—Red. to 4½ % from 31st Dec., 1905)	5	5 %	5 %	4½%	4½%	4⅛— 5⅛	4⅛— 5⅛	5 5/32	..	..	4 5 9

* Unless otherwise stated, all shares are fully paid. † Quotations on Liverpool Stock Exchange. § Interim Dividend.

Bank rate of Discount 2½ per cent., May 28th, 1908.

ELECTRICAL TRADE OF JAPAN IN 1906-7.

The following figures showing the imports into, and exports from, Japan of electrical and other materials during 1906 and 1907 are taken from the recently issued official trade statistics; information as to increases and decreases is added:—

	1906. Yen.	1907. Yen.	Increase or decrease. Yen.
Galvanised wire.—			
From United Kingdom ...	27,297	16,818	— 10,479
„ Germany	845,314	1,187,109	+ 341,795
„ Belgium	41,692	106,055	+ 64,363
„ Austria-Hungary ...	—	6,134	+ 6,134
„ United States ...	220,888	109,664	— 111,224
„ Other countries ...	2,796	1,141	— 1,655
Total	1,137,987	1,426,921	+ 288,934
Rails.—			
From United Kingdom ...	62,110	483,688	+ 421,578
„ Germany	1,035,924	1,579,110	+ 543,186
„ France	2,748	10,268	+ 7,520
„ Belgium	281,232	379,134	+ 97,902
„ United States ...	829,820	1,371,016	+ 541,196
„ Other countries ...	4,358	5,286	+ 928
Total	2,216,192	3,828,502	+1,612,310
Materials for building and posts for electric wire, and like materials.—			
From United Kingdom ...	365,447	1,251,814	+ 886,367
„ Germany	3,353	16,434	+ 13,081
„ Belgium	63,123	7,103	— 56,020
„ United States ...	471,641	887,285	+ 415,644
„ Other countries ...	559	16,251	+ 15,692
Total	904,123	2,178,887	+1,274,764
Submarine and underground cables.—			
From United Kingdom ...	102,663	567,888	+ 465,225
„ France	26,091	106,263	+ 80,172
„ Germany	68,455	619,662	+ 551,207
„ United States ...	10,432	39,188	+ 28,756
„ Other countries ...	—	143	+ 143
Total	207,641	1,333,144	+1,125,503
Insulated electric wire.—			
From United Kingdom ...	535,819	647,297	+ 111,478
„ France	35,181	104,710	+ 69,529
„ Germany	47,969	124,072	+ 76,103
„ Italy	5,283	17,687	+ 12,404
„ United States ...	332,282	234,403	— 97,879
„ Other countries ...	631	1,399	+ 768
Total	957,165	1,129,568	+ 172,403
Locomotives.—			
From United Kingdom ...	411,620	175,989	— 235,631
„ Germany	49,825	103,047	+ 53,222
„ United States ...	921,258	1,432,965	+ 511,707
Total	1,382,703	1,712,001	+ 329,298
Railway passenger and freight cars, and parts.—			
From United Kingdom ...	745,511	642,804	— 102,707
„ France	6,398	2,645	— 3,753
„ Germany	15,093	8,952	— 6,141
„ Belgium	109,222	16,812	— 92,410
„ United States ...	376,397	350,300	— 26,097
„ Other countries ...	636	—	— 636
Total	1,253,257	1,021,513	— 231,744
Parts of electric cars.—			
From United Kingdom ...	49,231	27,012	— 22,219
„ Germany	—	46,550	+ 46,550
„ United States ...	256,521	478,034	+ 221,503
„ Other countries ...	—	6,936	+ 6,936
Total	305,752	558,532	+ 252,780
Steam engines.—			
From United Kingdom ...	479,611	727,159	+ 247,548
„ France	—	74,250	— 74,250
„ Germany	32,524	31,220	— 1,304
„ United States ...	361,538	513,906	+ 152,368
„ Other countries ...	9,725	3,633	— 6,092
Total	883,398	1,350,168	+ 466,770
Gas, oil and hot-air engines.—			
From United Kingdom ...	153,430	431,855	+ 278,425
„ Germany	25,612	34,333	+ 8,721
„ Belgium	—	9,441	+ 9,441
„ Sweden	—	6,404	+ 6,404
„ United States ...	34,325	66,899	+ 32,574
„ Other countries ...	4,725	545	— 4,180
Total	218,092	549,477	+ 331,385
Steam turbines.—			
From United Kingdom ...	—	655,896	+ 655,896
„ France	—	5,887	+ 5,887
„ Germany	142	33,699	+ 33,557
„ Switzerland ...	8,240	1,427	— 6,813
„ United States ...	121,430	309,058	+ 187,628
Total	129,812	1,005,967	+ 876,155
Electric machinery.—			
From United Kingdom ...	442,534	707,513	+ 264,979
„ France	198,350	293,482	+ 95,132
„ Belgium	32,543	10,590	— 21,953
„ United States ...	1,129,312	1,526,874	+ 397,562
„ Other countries ...	8,756	4,478	— 4,278
Total	1,811,495	2,542,937	+ 731,442
Steam boilers.—			
From United Kingdom ...	942,814	1,212,933	+ 270,119
„ France	642	8,677	+ 8,035
„ Belgium	631	—	— 631
„ United States ...	284,414	236,543	— 47,871
„ Other countries ...	9,860	6,076	— 3,784
Total	1,238,361	1,464,229	+ 225,868
Pumping machines.—			
From United Kingdom ...	219,249	423,471	+ 204,222
„ Germany	33,296	161,637	+ 128,341
„ Belgium	8,693	20,274	+ 11,581
„ United States ...	190,441	477,096	+ 286,655
„ Other countries ...	1,339	5,461	+ 4,122
Total	453,018	1,087,939	+ 534,921
Lifting machines.—			
From United Kingdom ...	644,757	717,238	+ 72,481
„ Germany	231,248	220,036	— 11,212
„ Belgium	23,535	6,217	— 17,318
„ United States ...	186,484	129,647	— 56,837
„ Other countries ...	117	—	— 117
Total	1,086,141	1,073,138	— 13,003
Copper wire.—Total ...	29,229	16,623	— 12,606
Telephones.—Total	114,744	105,526	— 9,218
Electric lamps and parts thereof.—Total ...	236,393	126,790	— 109,603
Exports.			
Electric dynamos and motors.—			
To China ... ... } „ Kwantung province }	87,303	60,766 / 112,205	+ 85,668
„ Corea	11,581	70,739	+ 59,158
„ Other countries ...	2,239	1,479	— 760
Total	101,123	245,189	+ 144,066
Copper wire.—Total... ...	125,242	126,971	+ 1,729
Telephones.—Total	74,764	103,771	+ 29,007

N.B.—Yen = 2s. 0½d.

Continental Tour of Electrical Engineers.—On Monday last a party of engineers left for the Continent, under the ægis of the Key Engineering Co., with Mr. Leonard Andrews as their leader, to visit a number of large gas-engine installations; the programme was similar to that carried out last year, including visits to the iron and steel works at Homécourt, the Government mines at Heinitz, and the works of Messrs. Ehrhardt & Sehmer, with a trip down the Rhine. This year, however, visits to the works of Messrs. Thyssen at Mülheim and to the gas-power station at Bruckhausen have been substituted for some of the items in last year's programme. The gas engines to be seen, made by Messrs. Ehrhardt & Sehmer and Messrs. Thyssen, are of 1,200 to 2,000 H.P., and some of the latter are running on producer gas; four 2,600-H.P. Thyssen engines are also to be seen in course of construction and erection. We are informed that gas engines aggregating some 300,000 H.P. are in use in Germany alone for driving electric generators, and at Heinitz there will ultimately be over 10,000 H.P. entirely gas-driven. The party will see many gas-driven alternators working in parallel, the power being derived from blast-furnace, coke-oven and producer gas. It is hoped that they will also be enabled to visit an electric winding plant and an electrically-driven rolling mill. The visit is timed to end to-morrow. The party consisted of the following members:—Mr. H. Talbot, Sir John Turney and Mr. Councillor Clarke, of Nottingham; Mr. W. W. Lackie, Mr. Dalrymple and Mr. Ferguson, of Glasgow; Mr. Chattock, Mr. Councillor Ellaway and Mr. Councillor Freeman, of Birmingham; Mr. Watson, of Bury; Mr. Cramb, of Croydon; Mr. Percy Allen, Runcorn; Mr. Lynn, of the Power Gas Corporation, London; Mr. Crampton, Mr. H. B. Matthews and Mr. E. W. Cowan, of London; Mr. Slacke, of Manchester; and Mr. Andrews, London.

THE GERMAN ELECTRICAL INDUSTRY.

The First Results of the Industrial Reaction.

The large manufacturing companies have not waited very long before offering for subscription the additional capital which, as reported in a former issue, they had decided to raise for various purposes. No doubt the large sums required will be readily obtained in view of the financial support rendered by the banks associated with the undertakings. In addition to these, the Berlin Electricity Works Co., which has a monopoly of electric lighting in the German capital, has come forward for applications totalling £1,625,000 in ordinary shares and bonds. The money is largely needed for the acquisition of a considerable interest in the Electricity Supply Co., and for extensions of the company's own system.

The Felten & Guilleaume-Lahmeyer Works Co. had all departments briskly employed during 1907, and the new orders booked were in excess of those received in the preceding year. According to the directors' report, the turnover increased by 16 per cent., although the orders on hand at the close of the year were somewhat less than at the end of 1906. In consequence of the quiet course of the retrogression in conjunction with the circumstance that the purchase of raw materials was proportioned according to the orders for delivery, the company experienced no losses through the fall in the quotations for copper, tin, zinc and lead. The prices of dynamos, motors and accessories were still not in harmony with the cost of production. As to the new commercial treaties, the report pointed out that these indicated a considerable deterioration in the sale conditions for a number of articles and countries, and it was now seen that the export trade was more difficult owing to the increase in foreign duties. In addition to this a further prejudicial effect was produced by the differential treatment of the import duties on the part of the British colonies in favour of the Motherland, and to this was added the compulsory working of patents in the United Kingdom. The accounts show the following figures:—

	1907.	1906.
Share capital	£2,750,000	£2,600,000
Gross profits	772,237	751,141
Working expenses	287,582	257,915
Depreciation...	121,338	116,971
Net profits	329,781	356,486
Dividend	264,250	286,000
„ per cent.	10	11

The reduction in the dividend is attributed by the directors partly to a diminution in the yield on investments, and partly to a three weeks' strike at the dynamo works in the spring of the year. The Frankfort dynamo works delivered 9,330 machines, of a total of 358,000 H.P., as compared with 8,070 and 265,000 H.P. respectively in 1906. The number of officials and workmen advanced from 10,470 in 1906 to 11,760 last year, the dynamo works alone employing 5,225 of the latter. At the recent general meeting the chairman stated that the orders then available were approximately of the same extent as at the corresponding period in 1907, and that although a decline in the period of prosperity was being experienced, the situation of business in general could be regarded as satisfactory.

The Voigt & Haeffner Co., of Frankfort-on-Main, had a turnover in 1907 which was 20 per cent. higher than in the preceding year; but, notwithstanding this, the gross profits were slightly less, the causes being the increase in the prices of materials containing copper, and the difficulties of manufacture due to the unfavourable location of the different factories and the inadequacy of the workshops. This hampered the development of the undertaking, and it was therefore proposed to acquire a new site of larger extent in the near future. The net profits totalled £34,203, as compared with £27,728 in 1906; and a dividend at the rate of 10 per cent. has been declared, being the same as in 1906. During the year the company increased its share capital from £100,000 to £150,000. The number of officials and workmen remained at approximately 1,000, as in the previous year.

The shareholders in the Accumulator Works Co., of Berlin-Hagen, recently approved the accounts for 1907, and the payment of a dividend at the rate of 12½ per cent., as in 1906, on a share capital of £400,000. It was mentioned in the directors' report that the workshops at Hagen, Berlin, and at Hirschwang, near Vienna, were extraordinarily well occupied during the year, and the volume of business rose from £779,500 in 1906 to £956,500 last year. On the other hand, raw materials were dearer and wages and salaries were higher, and stocks depreciated owing to the fall in prices. The net profits amounted to £59,453, as compared with £59,464 in 1906. The participation in subsidiary undertakings again yielded increased receipts, and the company had acquired an interest in the Italian General Accumulator Co., of Milan, whose factory would be in full working at Malzo in a short time. Down to the end of March, 1908, the orders and sales represented a considerably larger value than in the same month in 1907.

The general meeting of the Hartmann & Braun Co., of Frankfort-on-Main, approved the directors' report and accounts for 1907. According to the report, the electrical engineering industry did not suffer so much as other trades from the downward economic movement; but, in consequence of the increasing competition in the manufacture of measuring instruments, the augmentation in the company's turnover was comparatively slight, although the number of officials and workmen advanced from 596 in 1906 to 639 last year. The accounts showed net profits of £26,370, as against £25,698 in 1906, and a dividend at the rate of 12 per cent. has been declared, or the same as in the preceding year. An increase in business took place in the first quarter of the current year.

The report of the Bergmann Electricity Works Co., of Berlin, for 1907, announces that all departments were well employed throughout the year, and the turnover increased by 30 per cent., the whole of the output being the company's own production. Costly preliminary works and experiments for various new branches of manufacture were paid for out of revenue, the methods of working were improved, and the capacity of the plant was increased. The financial position is as follows:—

	1907.	1906.
Share capital	£700,000	£700,000
Turnover	1,051,000	802,500
Depreciation provision ...	67,121	66,455
Net profits	137,990	115,226
Dividend, per cent.	18	18

A material extension of the machine department took place by the construction of steam turbines, and the abundance of orders allowed of the full utilisation of the enlargement of the turbine factory that has just been completed. During the year the company started the production of high-pressure apparatus, and extended the transformer branch; the specialisation of direct and polyphase current generators was proceeded with up to those of average sizes; the meter department was developed, the glow-lamp factory commenced the manufacture of metallic-filament lamps, and the building of motor-cars was inaugurated. The first three months of the current year have witnessed a noteworthy advance in the manufactures invoiced, and the orders still in hand ensure employment for a long time to come, the company providing occupation for an average of 4,000 workers.

The directors of the Land and Sea Cable Works Co., of Cologne-Nippes, in the course of their report for 1907, point to the appropriateness of their foresight in the previous year in having secured the undertaking against losses through fluctuations in prices by entering the stocks of copper and other materials at a low value. As far as sale prices are concerned, both those of Germany and other countries largely declined in advance of the falling market for raw materials, and, as a consequence, the prices could not always be kept in agreement with the cost of production. Although the company had some specially large orders in 1907, and enjoyed favourable market conditions, the volume of business remained about the same as in 1906. The net profits were £29,286, as compared with £34,657 in the previous year, and the shareholders have sanctioned the payment of a dividend of 8 per cent., as against 10 per cent. in 1906.

The accounts of the Mix & Genest Telephone and Telegraph Works Co., of Berlin, which were passed at the general meeting, indicated net profits amounting to £33,092 for 1907, as compared with £33,751 in the previous year. It was decided to pay a dividend of 9 per cent., this being the same rate as in 1906, on a share capital of £250,000. A proposal was adopted authorising the issue of new shares to the extent of £100,000 for the purpose of providing additional working capital, and undertaking the production of new manufactures.

The North-German Sea Cable Works Co., of Nordenham, experienced an unfavourable period in 1907. An abstract of the directors' report shows that a loss of £4,412 was incurred on manufacturing, cable laying and repair accounts. After writing down the value of raw materials, and providing for depreciation, the accounts represent a deficiency of £34,806, which, however, becomes reduced to £19,273 by absorbing the balance forward from 1906, the share capital amounting to £300,000. Including the balance from 1905 the net surplus realised in 1906 was £30,244, and a dividend of 5 per cent. was distributed.

The directors of the Accumulator and Electricity Works (late W. A. Boese) Co., of Berlin, state that the sales in 1907 again experienced a considerable augmentation. This was of special importance, having regard to the continued endeavours to create a monopoly in the department of stationary accumulators, and it showed that users were offering greater resistance to the formation of a ring in batteries. The net profits in 1907 amounted to £11,303 as contrasted with £10,856 in the previous year, and the directors proposed to pay a dividend of 2 per cent. on the £3,000 in ordinary shares, and 24s. per share on the £222,000 in preference shares, these being the same as in 1906. At the recent annual meeting, however, these proposals were withdrawn and the profits were partly transferred to the reserve fund and partly carried forward, the object being to financially strengthen the position of the company.

The net profits of the Wilhelminenhof Cable Works Co., of Berlin, amounted to £9,541 in 1907 as against £9,463 in the preceding year. A dividend at the rate of 15 per cent. on a share capital of £50,000 has been declared, this being the same rate as in 1906.

Peru.—Messrs. J. W. Brooke & Co., Ltd., of Lowestoft, have just delivered a 25-H.P. "Brooke" motor, six-cylinder, erected on its own bedplate, self-contained with radiator, water tank and petrol tank, and fitted with a 10 in. × 6 in. pulley for electric lighting work, the outfit to be shipped to Peru in sections not weighing more than 4 cwt.

THE CONGRESS OF THE TRAMWAYS AND LIGHT RAILWAYS ASSOCIATION.

The annual meeting of this Association was held on 9th and 10th insts., in the Congress Hall, at the Franco-British Exhibition.

The Duke of Argyll, President of the Association, and the Reception Committee, welcomed the members, and presided during the first portion of the proceedings.

Sir Clifton Robinson, who lectured on the subject of "Tramways of the World," reviewed the progress made since 1860, when George Francis Train introduced the pioneer street railway into Birkenhead, following it with extensions of his system in London, South Staffordshire and Darlington.

As to mechanical traction, the cable system, introduced into St. Francisco in 1873, marked the first real advance; this was followed by the introduction of the system in Chicago, New York, and other American cities, Highgate Hill (London) in 1884, and later in Paris, Birmingham, Edinburgh, South London, Melbourne, &c.

The first electric trolley line in Great Britain was the Roundhay route, Leeds, opened in June, 1893. He, the speaker, carried out the electrification of the Bristol tramways, which commenced running in 1895; he subsequently opened the Dublin Southern, Middlesbrough, Stockton and Thornaby, and in 1901 the first section of the London United Tramways. In this connection he pointed out the great opposition to the introduction of the trolley system at Hammersmith, when those tramways were proposed, remarking on the fact that the L.C.C. were themselves using it now in the same locality.

Speaking of British tramways generally, he saw no reason why they should not enjoy an indefinite period of financial prosperity, if skilfully managed and conservatively financed.

There were three points which handicapped us in comparison with other countries:—

1. Our tramway cars were not permitted to travel fast enough, the average speed being less than 10 miles an hour.

2. The double-deck tramway car in general use caused much delay, particularly at stopping points. The adoption of this type of car was consequent upon the regulation enforced by the authorities that no cars shall be licensed to carry any passenger for whom a seat was not provided.

3. Traffic could be handled more successfully on special occasions were the present licensing restrictions regarding passengers removed or amended.

It was undoubtedly the fact that in no other country in the world were such onerous conditions imposed upon the operation of electric tramways, and we were faced by the alternative that either we were right and all the rest of the world was wrong, or we were lagging behind the more progressive nations.

He was much struck during his recent journey with the development of electric tramways in Tokio, Yokohama, Shanghai, Hong-Kong, Singapore, Colombo, &c. These followed western models; indeed, most of them had been built and equipped by British engineers. In Japan, however, they were run by native officials; but in China, Europeans were in administrative command, as in those towns in India where tramways had been installed. The natives took well to the innovation. The cars were usually divided into two classes. The main obstacle to greater development in eastern cities was the narrowness of the streets; this was particularly noticeable in Tokio, the capital of Japan. That city was a network of electric tramways, either in operation or proposed, though there were several important main arteries of traffic too narrow to admit of even a single line of rails. The greatest possible impetus was given to the promotion of important lines of electric railways extending from Tokio and connecting with the large, and in some cases far distant, provincial business centres.

It was very difficult to draw any clear dividing line on the Continent of Europe between electric railways and electric tramways, as there were so many interurban lines which could be regarded as partly the one and partly the other.

Speaking of purely street lines, the greatest developments were in Berlin, in the hands of the great Berlin Tramway Co., and in Paris under a number of companies. There had been a bewildering variety of systems, but the overhead trolley ruled in most places. Track construction had also presented many varieties, but was gradually conforming to standards like our own.

A prominent feature on the Continent was the use of alternating current instead of continuous. Single-phase alternating current was, indeed, tried in America, but in Europe it occupied relatively a more prominent place.

The great variety of local conditions in different European countries, and of nationalities and customs, was reflected in the differences of equipments. As a rule, the operation was in the hands of companies.

An extraordinary little trolley line in Russia was equipped afresh and put into operation for five months of every year over the frozen River Neva, as St. Petersburg. Sleepers and rails were laid down, standards put up, trolley wires run across, and a system 1½ route miles in extent, run over the delta of the river, until the approach of the warm season.

In concluding, he pointed out that we had lagged behind in the race with other countries, not from any backwardness in our capitalists, inferiority in our engineers, or lack of enterprise in our business men, but because we had been bound by legislative restrictions and innate conservatism. But we had also profited by the experience and mistakes of those who led the way, and as a result we had produced apparatus and plant superior to that of any other country.

Tramway Rail Joints.

(*Abstract of paper by* Alfred H. Gibbings, M.I.E.E., A.M.I.C.E.)

The purport of this paper is to describe briefly some of the modern forms of rail joints for tramway track, and the methods which have been adopted to make the joint in operation as nearly as possible like the rest of the rail.

The modern permanent way in this country has become almost of standard construction. The track is usually formed by laying girder rails directly on a bed of concrete, but there are some exceptions, notably at Sheffield and Hull. At Sheffield, several experiments have been, and are being, tried with various forms of wooden sleepers laid longitudinally under the rails, to which the rails are anchored down by bolts and plates, and this sleeper forms a good support for the joints. It appears, however, too soon to say whether this method, in addition to forming a cushion for the rail, also results in a satisfactory joint. It would seem that any initial irregularity in the rail ends forming the joint would ultimately result in the well-known knocking, and would produce holes where the wheels jumped forward. At Glasgow, during the last three years, heavy cross timber sleepers have been adopted on all extensions and renewals of track. For the purpose of this paper, however, the ordinary concrete track will be assumed.

In most of the principal towns the rail weighs from 90 to 105 lb. per yard, according to the section.

With the inauguration of steam and electric street railway systems, deficiencies of jointings were quickly apparent, and all the trouble with bonds and fishplates, through pounding, began to be experienced.

Experience proves that in all cases joints have a tendency to become loose and "spring" through the continual passing over of the cars, and, however slight this springing may be at first, it is rapidly increased by every car which passes over it. Hence, when the joint is badly worn, it appears that the only remedy is to cut out and renew either the joint or the concrete beneath it, or both. This becomes a very expensive operation, and necessitates removal of setts and paving. It seems to follow, therefore, as a natural deduction from the foregoing remarks that fishplates should not be required to take a vertical thrust.

The function of fishplates should be confined to jointing the web, and the vertical thrust should be taken by some other means.

The principal types of rail joints are comprised under one or other of the following classes:—(*a*) Sole Plates; (*b*) Welded Joints; (*c*) Anchors; (*d*) Combinations; (*e*) Adjustable Joints.

In order that the latest practical experience might be brought to bear upon this subject, the writer submitted a list of inquiries to several tramway managers, and they very kindly responded to the request for information. Their replies are embodied in the following paragraphs, and they record wide and diverse experiences.

The original and simplest method of taking the vertical thrust at the joint was by means of sole plates and fishplates. Sole plates are now in use at Hull and Darwen. In the case of Hull the rail ends are cut to an angle of 45° in plan, and the rails are laid on continuous creosoted sleepers.

At Darwen they are apparently being discarded in favour of other types.

The principal welds are the "Falk," the "Thermit," and the electric. One or other of these welds is in use in many towns, including Glasgow, Leeds, Southampton, Nottingham, Liverpool, Brighton, Darwen and West Ham. The replies from Brighton and Darwen are both favourable to the welded joint, but it does not appear that welds have been extensively used in those towns.

There can be no doubt that when two rail-ends are thus fastened together with a close joint, the result will appear theoretically and practically perfect. As a matter of fact, however, the rail-ends in some portion of the rail and rail head always remain severed, and this occurs principally near the running surface or point where the real wear takes place. In other words, the weld is the least effective and satisfactory at the point where it is most required.

The difficulties of making a satisfactory practical weld are many and obvious. The difference in the chemical composition of the two metals in the case of the "Falk" and "Thermit" welds, and the great cost of the electric weld may be cited by way of illustration. All three processes also tend to alter the temper and nature of the rail-ends, and so produce a new fault while remedying an old one.

The opinion at Glasgow is that the welded joint is the most satisfactory from every point of view, except in the case of renewals; at Leeds and Southampton a similar opinion is expressed.

At Nottingham it seems to be the practice when a renewal is required, to cut out the weld for a distance of about 18 in. on each side of the joint, and then to insert a new piece of rail, thus getting two joints in place of one.

The important question, with regard to this method is what is going to be the result in a few years, when large renewals become imperative. The solution is not an easy one to suggest at the moment, but putting all practical difficulties aside, the inference is that the cost will be heavy.

Among the more prominent types of anchors in use in this country are the "Cooper," "Winby," "Kirkland," "Bull Dog" and "Positive" rail anchors.

The anchor joint, in one form or another, appears to have appealed to a great number of engineers, and may be found in use on the majority of tramway undertakings.

Anchors are preferred or are used in Burnley, Huddersfield, Bournemouth, Wolverhampton, Birmingham and Darwen. The writer has also put them down throughout a 25-mile system of tramways.

The Cooper anchor, or piece of inverted rail, may be fastened to the rail either by bolts or rivets. Bolts are hardly likely to be satisfactory, as, like fish-plate bolts, they tend to work loose.

In all cases of anchors at joints, the ordinary type of fish-plate is used, the function of the anchor being merely to prevent springing of the rail ends.

The success of this method of jointing depends absolutely on the stability of the concrete in which the anchor is buried, the nature of the soil beneath the concrete, and getting a true alignment on the running surface, without grinding.

The experience at Burnley is interesting, and tends to bear out entirely the dependence on the condition of the soil and concrete. It is there claimed to maintain a good joint, but that hammering develops after two or three years, when the rail has to be ground. It is further stated to be bad for the rolling stock, and that rigid foundations and hammered joints break the car axles.

A combination joint consists of a device in which an attempt is made to distribute the forces and counteract the effects of the hammering and pounding.

The Continuous Rail Joint Co., of Great Britain, Ltd., claim that their type of combined fish-plates and sole-plates "preserves the much-desired continuity of wave motion, at the same time maintaining the joint in good condition by preventing any play between the rail surfaces and holding the rail-ends in alignment." Booth's rail joint is very similar—in fact, it differs only in two details, viz., (1) the separate sole-plate which (2) extends entirely under the flange. It is difficult to see what different effect in practice there can be between the two types, provided that the fit to the rail section is equally good in both cases. It is just this qualification which is likely to constitute the chief difficulty and obstacle in practical application.

On the Cavehill and Whitewell tramways, "positive" rail anchors are fixed at each end of the continuous rail joint. It would be interesting to know what is the cost for joints and anchors on that line per mile of single track, but, apart from that, the solidity of the joint, if laid on concrete, must be rather more than the rest of the rail.

Reverting to the question of the fitting of these joints, no absolutely accurate fit between the head and flange can be assured, because, in practice, no two rail-ends which are brought together to form a joint are rolled exactly to the same section. It is this slight difference, which gives rise to the trouble of knocking and hammered joints.

With regard to the "Dicker" joint, these have been put down in several towns, and particular reference to them is made by Preston and Darlington. Some experience of these joints has been obtained at Liverpool, and also on the Tooting lines of the London County Council.

Several years ago an attempt was made to forge out the fishplate and rail-end in one, by means of a portable hydraulic press and furnace. The rail-end was formed in such a manner that the joint faces were at an angle of about 30° with the rail edge.

The idea was never successful in practice for several reasons. First, the cost was prohibitive; and, secondly, the rails were much shortened in the process. The re-heating also had the effect of softening and injuriously affecting the steel.

The adjustable joint differs in almost every particular from those which have been described herein.

Any depression due to the rolling load or any other cause, is readily adjusted by the use of a box-spanner without any disturbance of the paving. Hence the joint can always be maintained as satisfactory as the rest of the rail. In adopting this type for new tracks, the heavy fishplates can be dispensed with, and shorter mild steel plates substituted.

The question of bonds and bonding is intimately associated with, and directly affected by, the form of jointing device adopted, hence these brief remarks so far as the subject is involved.

In considering this part of the subject, the devices may be divided into two classes, viz.:—(*a*) Those in which the fishplates are retained, and (*b*) welded joints.

The universal practice is to use two bonds per joint in order to obviate the "gathering" of the current, and it is admitted that the best position for them is one at the top of the web and the other at the bottom.

The "anchor" joint, the short bond and the concealed bond may be used without seriously affecting the efficiency of the lateral support; with the "combination," or continuous rail-joint, the only alternative is to use a long and unprotected bond, thus rendering that method still more expensive.

Discussion.

Mr. J. R. Salter, who opened the discussion, thought that the author had neglected the question of paving, for the matter of rail joints was closely bound up with that of paving, owing to the necessity of keeping the track and paving relatively fixed. The ideal track was a flexible one; he had a section of tramway track laid on sleepers and without concrete, but the trouble arose with the paving, which was, of course, rigid. This style of track work was also used in Moscow, but the paving difficulty was not prominent, owing to the long winter period when only sledge traction was in use.

Mr. J. B. Hamilton expressed his belief in concrete foundations, but complained of the short life of track laid in the ordinary way. Since 1902 he had (in Leeds) been using welded joints—which were very satisfactory in themselves—but this was no use without suitable anchoring, and he thought the author had done well to draw attention to the matter.

Mr. A. Banister said that he had had some 5,000 Falk cast joints in use at Norwich for about eight years and had not had any broken. For extensions and repairs he had adopted Thermit welded joints (some 450 having been made) and this was because the latter were equally cheap to make singly or in quantity, whereas the Falk joint was expensive unless done in quantity. All the joints described by the author seemed to require machine shop labour, such as could not readily be obtained on the road; the average labourer was not competent to do accurate fitting. The adjustable rail joint, if lifted by way of adjustment, allowed water to filter in under the pavement and caused a swamp at the joint. The great thing was to obtain a joint which would not disturb the paving.

Mr. Stutz said he did not consider that the Falk weld was a real weld—there was no actual fusion, although there was adhesion. The Thermit weld was much more extensively adopted than appeared from the paper, and it was generally giving satisfaction.

Mr. E. Benedict asked as to the conditions under which wooden sleepers were used on tramways; judging from railway experience, they would give elasticity, but the adjustment seemed to be a matter of difficulty.

Mr. H. M. Sayers remarked that the vertical rigidity of the joint should be equal to that of the rest of the track—*i.e.*, the track should be equally rigid or elastic throughout its length. The use of deep vertical anchors often led to the sacrifice of the concrete substructure. Bolted or fitted joints covered with paving would always give trouble, and he favoured the welded joint, in spite of the fact that the rails were softened on either side of the joint in the process of welding. Electrically the weld was almost perfect.

Mr. Stephen Sellon considered that an elastic bed was easily obtainable, and was preferable if it could be used without paving troubles. He was against the introduction of elaborate systems of anchor joints, as simple systems of construction were in use and were giving satisfaction. He thought possibly the fact of there being plenty of money behind many tramway undertakings really led to the introduction of additional complications in track construction. So many novelties were introduced, and they required such a long time to prove their value that it was best to leave them alone. Local conditions really decided the necessity for their use or otherwise.

The matter closed with some remarks from Sir J. Clifton Robinson, Mr. Gibbings deciding to communicate his reply.

ELECTRICITY IN AGRICULTURE.*

By Sir Oliver Lodge.

Some thirty years ago a Swedish Professor named Lemström sought to elucidate the Aurora Borealis by trying to imitate its appearance by electrical experiments. For this purpose he produced high-tension discharges of various kinds, and sent them through vacuum tubes until he got an appearance very like those of the Northern Lights. Some of these experiments he conducted in his greenhouse, and he noticed incidentally that the plants seemed to thrive under the treatment, and that the electrification thus produced in their neighbourhood appeared to do them good. He also noticed, as remarkable, the flourishing development of plants in Arctic regions, where the sunlight was very weak; and he attributed part of this growth to the influence of electric discharges.

He says that when the plants in the North of Norway, Spitsbergen and Finnish Lapland, have resisted the frequently destructive night frosts they show a degree of development which greatly surpasses that of plants in more southern regions, where the climatic conditions are more advantageous. This rich development appears principally in the fresh and clear colours of the flowers, in their strong perfume, in the rapid development of the leaves on the trees, and their scent, but particularly in the rich harvest which different seeds—such as rye, oats and barley—will produce when, as before stated, they are not destroyed by the frosts. From a bushel of rye sown they will often produce 40 bushels, and from barley 20 bushels, and so forth. It is the same with grass. These results are attained although the people cultivate their soil very imperfectly, using only ploughs and harrows of wood.

He pursued the matter by careful observation, taking test plants in pairs or groups, electrifying one group—that is to say, discharging some electricity into the air above them—and keeping a similar group away from the electricity, in order to be able to compare them. Then he photographed the two groups side by side, and found in nearly all cases a marked improvement as the result of the electrical treatment. He concluded that the needle-like shape of the leaves in fir trees, and the beard on the ears of most cereals, had the discharge of electricity as their function, and found that they did act in this way.

It can hardly be doubted that the electrification of the air has some effect on growing plants. For it is found that, under the influence of sunshine, electrified plants can give off electricity into the air from the leaves; and the fact that the air is electrified relatively to the soil requires that the plants shall be electrified too, so that in all probability they are in a constant state of slow

* Abstract.

electrical discharge, which becomes more rapid when the sun is up. In what way this discharge of electricity from their growing tips and hair, and surface generally, really acts must be studied and reported on by physiological botanists; but it is natural to suppose that it cannot be without influence, and reasonable to think that that influence must be beneficial—a hypothesis which direct experiment confirms.

When, after some preliminary experiments at Bitton, Mr. J. E. Newman, of Gloucester, acting in conjunction with Mr. R. Bomford, of Salford Priors, determined to try the phenomenon on a really large scale, and came to me to see if I could help them electrically, and enable them to maintain a continuous high-tension discharge for hours together each day over ten or eleven acres by means of power furnished by an oil engine and dynamo, I very willingly assented, and set my son, Mr. Lionel Lodge, upon the job.

The method is to stretch over the field to be treated a number of wires on poles, high enough for loaded wagons and all the usual farming operations to go on underneath the wires without let or hindrance. The wires are supported on the posts by elaborate high-tension insulators, and they extend over all the acreage under experiment, a control plot of similar land under similar conditions being, of course, left without any wires.

The system of conductors is then connected at one post with a generator supplying positive electricity at a potential of something like a hundred thousand volts, and with sufficient power to maintain a constant supply of electricity at this kind of potential.

Leakage immediately begins, and the charge fizzes off from the wires with a sound which is sometimes audible, and with a glow which is visible in the dark. Anyone walking about below the wires can sometimes feel the effect on the hair of the head, as of a cobweb on the face. They are then feeling the stimulating action of the electrification.

The electrification is maintained for some hours each day, but is shut off at night; it is probably only necessary to supply it during the early morning hours in summer time, and in spring time or in cold cloudy weather for the whole day, or during the time of the plant's greatest activity. But at what stages of the growth of a plant the stimulus is most effective has still to be made out. However, in the case of wheat, both the ear and the straw are valuable, and the electrification is accordingly applied for a time each day during the whole period of growth until stooling begins.

The power required to generate the electricity is very small, for although the potential is high the quantity is insignificant, and the energy is accordingly comparatively trivial. It is known that even when natural atmospheric electricity has accumulated intensely, and has become a thunderstorm, the quantity even then is quite small, though the potential or tension is so enormous that the flashes are of astonishing violence and power while they last.

The electricity can be generated in more than one way. It can be generated by the revolving glass plates of a static influence machine, usually known in this country as a Wimshurst machine; or it can be generated by transforming up to high tension, and rectifying to one direction, the current of the revolving magnetic generator called a dynamo. The first is in many respects the simplest, and was used in the early and small-scale experiments, but it can hardly be regarded as an engineering method adapted to continuous or rough use. The latter is the one which in the trials now to be described we have adopted.

The power is generated by a two-horse oil engine driving a small dynamo in an outhouse of the farm. Thence the current (3 amperes at 220 volts) is taken by ordinary overhead wires to the field, where they enter a suitable weather-tight hut, which contains the transforming and rectifying apparatus. The only moving part here is the "break," and if the original dynamo had been an alternator, even this might have been dispensed with. The transformer is a large induction coil, specially made to stand continuous use, and its current is rectified by means of vacuum valves in accordance with a patented device of my own.

The negative electricity is conveyed direct to earth, while high-tension electricity, all of positive sign, is led by a specially insulated conductor out of the shed to the nearest post of the overhead insulated wires, which are thereby maintained at continuous high positive potential.

The overhead system of wires covered about 19½ acres of ground. The wires were mounted on insulators placed upon larch poles some 15 ft. high, which were placed in rows, the rows being separated by a distance of 102 yards, and the poles in a row being 71 yards apart. Stout telegraph wire carried the current down each row, while thin galvanised-iron wires, placed some 12 yards apart, were stretched between the rows, and acted as the discharge wires. In this way 22 poles were sufficient to support the wire over the 19 acres. Roughly, only one pole per acre is required, therefore the inconvenience is practically nil.

Owing to the flexible suspension, risk of breakage to the wires is very small. During the two years the wires have been up at Bevington, apart from a few wires broken at harvest time by catching the top of an extra high wagon-load, only one wire has fallen.

The acreage was spread over two different fields: in one field some 11 acres of wheat were under treatment, in the other 6½ acres of barley, and a half-acre plot planted with potatoes, mangolds, &c.

The wheat field was of 18½ acres extent; the remaining 7 acres were sown with English (White Queen) wheat, 1½ acres, and Canadian (Red Fife) on 5½ acres. In the electrified part Canadian wheat occupied 2½ acres, English wheat 9 acres.

The results on the barley field, including the small plot, had to be neglected owing to the great local variations produced by the very irregular manuring the field had previously undergone; the wheat field, however, as far as one could judge, had been very uniformly treated previously.

In the wheat, a difference was noticeable at an early stage, the young blades on the electrified part being, in the opinion of many observers, of a darker green.

The crop was judged as considerably heavier by several practical observers, and the straw was, on an average, from 4 in. to 8 in. higher. Both experimental and control plots came into ear at about the same time, but the Canadian wheat under treatment was ready for cutting some three or four days before the control area.

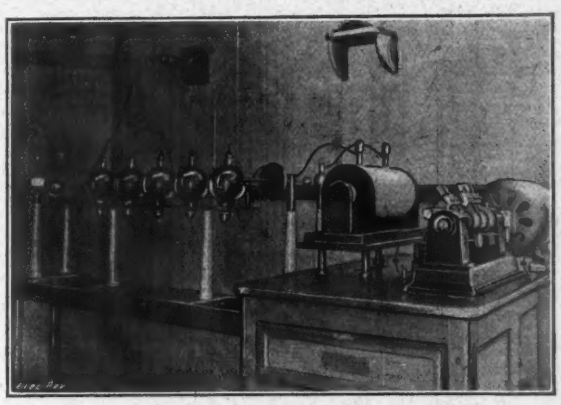


Fig. 1.—Inside the Transformer Shed, showing Sir Oliver Lodge's Inductive Break, Special Induction Coil and High-Tension Valves, for Supplying Continuous Current at 100,000 Volts.

The following is a very brief summary of returns and information supplied to me by Mr. Newman and Mr. Bomford, showing the results from the electrified as compared with the control unelectrified plots.

Summarised Results of the 1906 Experiments.

Bushels of Wheat per Acre.

(Estimated corresponding increase in straw not measured.)

	From the electrified plot.	From the unelectrified plot.	Increase.
Canadian (Red Fife) ...	35½	25½	40 per cent.
English (White Queen)...	40	31	30 per cent.

Moreover, the electrified wheat sold at prices some 7½ per cent. higher, several millers in baking tests finding that it produced a better baking flour.

The increase appears to be mainly due to better stooling. No marked difference was observable in the development of ears.

Mr. J. Kirkland, of the National School of Bakery, Borough Polytechnic, found the evidence from baking tests supported by the average of dry glutens from all his tests thus:—

In the electrified	...	11·15 per cent.
In the unelectrified	...	10·35 per cent.

The somewhat poor yield of wheat obtained from the unelectrified portion of the field is probably explained by a deficiency in lime, which has now been rectified. Further, the wheat was spring

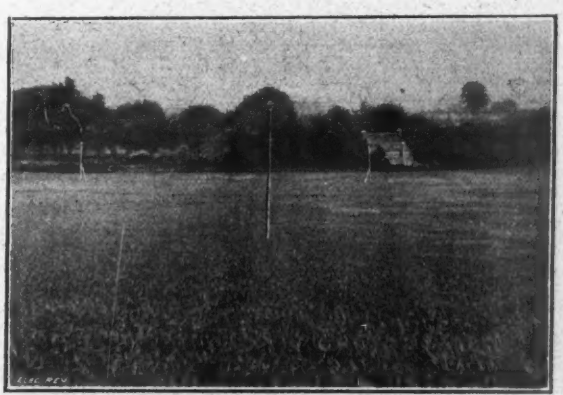


Fig. 2.—Part of the Wheat Field, showing the Posts supporting the Electrical Discharging Wire. The Wire itself is so Fine that it does not Show.

sown, and Red Fife, under this condition, does not usually yield good crops. The experiments are being repeated upon wheat during the present season, and strawberries are also under treatment once more.

In 1907, wheat was grown again in the 1906 wheat field. Current was cut off from most of the barley field, which was down to clover

and rye grass; 8¼ acres in an adjoining field were planted with strawberries (Stirling Castle) in March, approximately 2¾ acres having a wire network erected over them. Mangolds were planted between the strawberry rows.

The wheat field during the early spring was given a dressing of lime 10 cwt. to acre, 4 cwt. to acre bone meal drilled in; the unelectrified part was given 1½ cwt. sulphate of ammonia, and the electrified part ¾ cwt. Barley had been grown on the strawberry field in 1906, and this was given 10 tons to the acre of farmyard manure, which was ploughed in.

Result of Crops, 1907.

Wheat.

(Variety, Red Fife, Spring Sown.)

7½ acres unelectrified gave 239 bus. 38 lb. Head Wheat, 15 bus. 1 lb. Tail.

11 acres electrified gave 455 bus. 50 lb. Head Wheat, 17 bus. 27 lb. Tail.

Or, summarising as before:—

Bushels per Acre (Head Wheat).

Electrified.	Unelectrified.	Increase.
41·4	32	29 p.c.

Electrified wheat brighter and a better sample. Increase due to better stooling and also better filling-out of ears.

Hours Plant Running.

1906.—March 16th to July 10th, inclusive, 621¾ on 90 days. Average electrical pressure corresponded to a ¾-in. spark.

1907.—March 28th to July 27th, 1,014 hours on 115 days. Average pressure corresponded to a ½-in. spark.

Strawberries.

This being the first year, the crop was necessarily very small, and was picked chiefly to see if any increase had been obtained. The result showed a 35 per cent. increase. Earlier ripening was also observed.

Mangolds.—It was found impossible to weigh either the whole or a part of this crop. Estimated increase (from number of cartloads removed) 25 per cent. Analysis showed an increase in the sugar where electrified, but the results varied considerably.

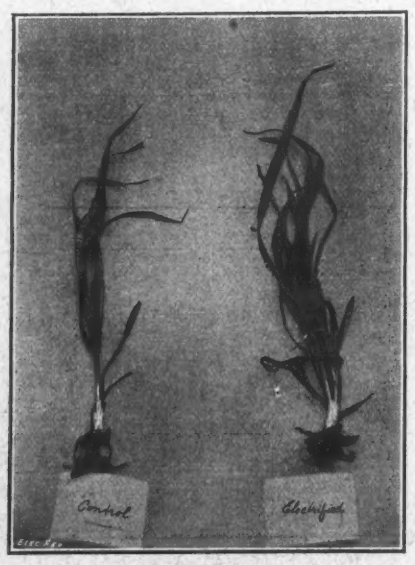


Fig. 3.—Comparison of Electrified Wheat with Wheat grown in the Control Field under the same Conditions; an Average Plant being taken in each Case. Note the Broader Leaves and Greater Number of Shoots of the Electrified Wheat.

Small plots of raspberry canes showed a marked improvement in growth. A curious point about the raspberries was that the foliage and fruit on the old canes showed no difference, but that the new growth, particularly after the old wood was cut back, showed an enormous difference in favour of the electrified. The manurial treatment was exactly similar.

Small plots of tomatoes also showed a large increase in the crop.

Those interested in the experiments are much indebted to the enthusiastic co-operation of Mr. Bomford. It may be interesting to note that it was at a farm belonging to Mr. Bomford's father that the first steam ploughing in England was done.

Prof. Lemström is undoubtedly the pioneer in this sort of work; though circumstances connected with the natural electrification of the atmosphere, and with the discharge of electricity from various surfaces, have been pertinaciously examined by Profs. Elster and Geitel.

Prof. Lemström published his results with full details and illustrations, both of the apparatus used and of the appearance of some of the resulting crops, in a small book called "Electricity in Agriculture and Horticulture," published in English by the *Electrician* Co. in 1904, and it is well worth referring to.*

The Abbé Berthelon, in 1783, raised a head of metallic points in the air, in the manner of a lightning conductor, and made it terminate in a series of discharge points just over the plants. He states that the use of this apparatus was invariably accompanied by an improvement in the appearance of the vegetation and by an increase in the fertility of the plants.

An opposite or control experiment was made by Grandeau in 1879, when he protected a plant from atmospheric electricity by means of a wire cage, and showed that its development was greatly retarded.

Other experimenters have done the same thing and made careful measurements of the results, which are all in the same direction.

Prof. Berthelot compared the growth at the top of a 28-metre tower with that of plants growing at the foot, and considered that the greater growth at the higher level was largely due to the potential gradient in the atmosphere.

Dr. Cook, of Bristol, likewise obtained an increase in the rate of growth by the use of an overhead discharge on a small scale.

During the winter of 1904 Mr. J. E. Newman installed a small trial apparatus, consisting of a small influence machine of the Wimshurst type and overhead discharge wires, at the Golden Valley Nurseries at Bitton, near Bristol. The wires ran about 16 in. above the tops of the plants, or above the rows of tomatoes in the glasshouses, and short pieces of fine wire, with the free ends pointing downwards, acted as discharge points.

From March 7th to July 26th the machine was running during 108 days for a period of 9·3 hours daily, principally at night.

In all cases control plots were provided, which, as far as practicable, were under identical conditions, and the very favourable results obtained led to the experiments on a larger scale above described.

AWKWARD WIRING RUNS.

The maxim that "a bad workman blames his tools" is a very true one, and, therefore, an awkward wiring contractor is very liable to make an awkward wiring run. There are, however, cases which one comes across in practice in which even the genius finds himself face to face with a particularly stiff job, and it may be worth noticing one or two of the difficulties which stand in the way of securing plain and simple runs, and the methods that could be adopted to overcome these obstacles. Just as an architect can design a neat and compact house, if he is a smart man, quite as easily as another man can put up an awkward structure, so a wireman can by a proper grasp of his work, with the addition of a flash of the brilliance which makes his business superiority secure, make the difference between a smart piece of work and a methodical "keep to the track" sort of job. A man with a little thought and originality can obviate many a sharp twist, and yet do sound work all the time.

The first stumbling block to be overcome is usually the electricity supply company. Their contention, which is perfectly correct from their own point of view, is that they must enter the premises to be wired at the point nearest to their mains, and from that point the wireman is compelled to carry the installation to any point at which the consumer requires his supply; usually the point of entrance of service is situated in the basement. If there are several floors to be wired, each having the usual distribution board, an endeavour should be made to run the mains along the shortest route to the staircase, or to some other portion of the building where the conductors can be carried straight up through each floor with the minimum of cutting. Even should the distribution boards be not required exactly at the points where these mains pass through the floors, wires can be led off to every position of distribution board, but in the majority of cases it is desirable and requisite that distribution boards should not be inside a room, so that the landings are as good places as can be found in the building for these points.

It will usually be found that the buildings which give the most trouble in wiring runs are those which have been erected for some time, inasmuch as at the present day new buildings are generally wired before the decorations are finished. This frequently involves the fact that the premises which are the most trouble to wire are in a dry and well-

* Prof. Lemström's experiments were fully reported in our issues of November 4th and 25th, and December 2nd and 16th, 1898.—Eds. E.R.

insulated condition, so that there is not much difference electrically whether wood casing and capping or steel tubing is used. The great point to bear in mind in wiring such buildings is to endeavour to make the appearance of the protection used for the wires agree as nearly as possible with the surroundings. For example, a picture rail or wood dado along a passage may well be imitated and used to conceal the wires; even plain casing judiciously fixed and suitably coloured can be rendered almost unnoticeable.

If it is required that lights be suspended from the ceiling, and it is found that it is impossible to run the casing underneath the floor immediately above that ceiling, it will be necessary to put the casing directly on the surface; instead of running direct to the ceiling rose and then finishing, it will probably give a better appearance if the casing is carried right across the whole ceiling, so as to render the latter more symmetrical and pleasing in appearance.

A point which is often lost sight of, and which tends towards the simplification of awkward runs, occurs when a portion of the building that has to be lighted is at a distance from the main building or from the point of supply. If, instead of taking devious and complicated courses through the building itself, the wiring is carried outside the structure, the work is greatly simplified. Very often overhead mains may be resorted to, with a great gain in efficiency, simplicity, and cheapness; but even if this is objected to, it is quite permissible to adopt a system of screwed watertight conduits, neatly placed on the outside walls.

Places of worship provide many wearying tasks for the average wireman, and in such cases, if the building be of any size and beauty, it will be good policy to call in an experienced wood-worker to assist in the wiring run, as the best of wiremen cannot be expected to be expert carpenters or cabinet-makers. With the aid of such a man it will be an easy task to fix wood-work to contain the wires, which will match the surroundings, if the work has to be carried on the surface.

Some of the older factories and workshops which have increased in size with the growth of the business of their owners have very often many awkward turns in the proposed wiring arrangement, and the use of overhead mains, unless very high, may be out of the question; in trying to make short runs, moreover, circumstances will often not permit of the ground being disturbed for laying underground cables. When one is confronted with a case of this sort, if one cannot go over or under the obstacle, then the only plan is to go round it, carrying out the wiring by means of bare cables overhead or cleated to the walls. In wiring places of this description one is not bound to study the æsthetic point of view, so that a freer hand is given in making bold innovations. Cables can be slung across the roof principals, supported on porcelain insulators, or put into conduit and sunk flush with the floor, the wiring being carried up to the lights at the various points in pedestal form.

If the mains are being carried up a staircase and a twist has to be taken over a stone landing, the cables can be made almost unnoticeable by using, as their only covering, a piece of extra-heavy sheet lead. In carrying cables through floors, it is not always possible to get a direct course for the purpose of using a piece of casing or conduit. In such circumstances it is useful to slip a piece of lead pipe over the cables, which, at the point considered, will give a flexible and ample protection.

The above notes show that a wireman who has a little resource and ingenuity will be able to surmount most of the troubles that present themselves due to apparently awkward runs. The difficulty of any wiring run does not generally or altogether arise out of the job itself, but is often due rather to the way in which an inexperienced customer wishes the work to be done in order to suit a special fad, while he is not prepared to meet the extra cost of special work. It is generally presumed that because electricity with all its attendant advantages is being adopted one can do anything one likes with regard to the wiring, but while this is true in a great degree there is a limit in all things. If the licence that is allowed to the people concerned in installing gas in hacking and disfiguring the walls were allowed even in part to electrical contractors, there would be no need for any such article as the present one, inasmuch as any run could be conducted to a desirable point by means of brute force.

FOREIGNERS AND ENGLISH PATENTS.

[FROM A LEGAL CONTRIBUTOR.]

In our leading article of last week we drew attention to the fact that American and German inventors are becoming aware of the fact that they must work their English patents on English soil. Large sums, it is reported, are being spent upon costly sites in manufacturing districts.

Making due allowance for the enthusiasm of those who support the principle of Mr. Lloyd-George's Act of 1907, it is manifest that this measure will compel some foreigners to work inventions in England, or confer upon some of our countrymen the right to do so.

We have no doubt that there are a certain number of electrical patents now in force which have never been worked in England; and whatever disputes may rage as to the exact force and effect of the Act passed last year, it is obvious that sooner or later these patents may become forfeited, if their owners do not comply with the law.

In view of the fact that some of our readers probably have been, and that others soon will be, approached with a view to their becoming licensees of patents, it may be useful to write a few notes upon the question of licences. The licence itself is a technical document which must be drawn by a lawyer if large interests are at stake: but the "layman" can best instruct the lawyer when he is blessed with some slight knowledge of the document which he is to be called upon to sign.

The Nature of a Licence.—A licence may be a bare licence, in which case, whether it is exclusive or not, it is revocable at will; or it may be a licence coupled with an interest in the invention to which it relates. If it is coupled with an interest, the Court will construe it as irrevocable and binding on both parties for the full period for which it is granted, though the failure to observe conditions incorporated in it may entitle the licensor to treat it as forfeited and to sue the licensee as an infringer.

The phrase "licence coupled with an interest" may be thus illustrated. Where the licence was an authority enabling the licensees not merely to make the patented articles, but also to sell them when made to any persons they liked and at any profit they liked, provided they paid the stipulated Royalty and complied with the terms and conditions of the licence—this was held to be a licence coupled with an interest, and as such, not revocable at will.

Different Kinds of Licence.—A patentee may impose what conditions he thinks fit upon his licensees; and if they accept licences from him, with knowledge of such conditions, they are bound by them. The licence may extend to the whole or part of the invention. It may also limit the exercise of the patent for a particular time or for a particular district. Thus it would be competent for a German patentee to allow his monopoly to be exercised for a year in Scotland or in England.

The usual return received by the patentee is so much on each article sold, with a minimum payable in any event. The licensee should be careful to see that the patentee shall keep the patent in force by payment of the proper dues to the Patent Office. His position, with regard to the validity of the patent, is somewhat anomalous. As licensee, he cannot dispute the validity of the patent; and if its validity was infringed during the currency of the document, he would still have to go on paying royalties until the expiry of the term. The wily licensee will see that there is inserted in his licence an express guarantee that the patent is valid, and that the payment of royalties is only to continue so long as that validity is maintained.

Other Methods of Disposing of Patent Rights.—A patentee can also dispose of his privileges by assigning his patent to another person. This transaction is generally carried out by payment of a sum down; but our readers need hardly be

warned of the danger of buying a patent outright which may prove to be wholly worthless. To acquire a legal title, he must get the patentee to sign a deed of assignment, which is usually prepared at the expense of the purchaser. It must be registered at the Patent Office. Before carrying the transaction through the purchaser should cause the register at the Patent Office to be examined in order to ascertain that no previous assignment by the seller to anyone else has been registered. He should register the deed of assignment without delay.

OUR LEGAL QUERY COLUMN.

[*Questions addressed to this column should be written on one side of the paper only.*]

"TAME" writes:—"A Statutory Authority under Provisional Order or Special Act has been asked to give a supply to a works whose land is without the Authority's area but adjacent thereto, a river forming the boundary line between the two districts. The district in which the proposed consumer is situated is within another Authority's area of supply. Can the first Authority to which application is made give a supply with overhead lines across the river to the land on the other side which belongs to the person making the application?"

*** This query has often been considered in this column on former occasions. It is clear that the answer must be in the negative. Sec. 4 (2) of the Electric Lighting (Clauses) Act, 1899, provides that undertakers shall not at any time after the commencement of the special order supply energy, or except for the purposes of that order erect or lay down any electric lines or works beyond the area of supply otherwise than under the authority of Parliament, or under a licence granted by the Board of Trade under the principal Act. Supply by overhead cable across the boundary of supply would clearly be an infringement of this section. The point has not been decided in relation to electricity, but it has clearly been held in relation to gas, that a gas company has no right to send its product through pipes to be consumed elsewhere than within the statutory boundary (see Gas Light and Coke Co. *v.* South Metropolitan Gas Co. 62 L.T. 126).

"W. J." writes:—"Assuming that an hotel which is using gas changes over to an electric supply company and still wishes to retain a gas stove—

"1. Can a gas company legitimately refuse to continue the supply for this gas stove? Also, in the event of their entering such premises and cutting off the supply and removing the meter with the consumer's consent, can an action for damages be entered against them?

"2. Can a gas company legitimately refuse to give a consumer a supply of gas for a gas stove except on the condition that he discontinue the use of electric light altogether and substitute gas in its place?"

*** The answers to these queries depend entirely upon the terms of the contract between the gas company and the consumer. This contract is not before the writer. With regard to the first question, as a rule an agreement for the supply of gas contains a provision that the consumer shall pay a certain minimum rent. On failure to pay that, the supply may be cut off. That is one of the remedies which the law provides for the gas company. Moreover, upon failure to pay for gas supplied, the company may enter and remove a meter. But there is nothing to prevent a consumer using no gas at all or to prevent him laying down an electric installation. His doing so would not justify the company in refusing to continue a supply.

With regard to the second question, it is difficult to imagine that any gas company could exercise such a power, or place any restriction upon the use of electric light.

NEW PATENTS APPLIED FOR, 1908.

Compiled expressly for this journal by W. P. THOMPSON & Co., Electrical Patent Agents, 322, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

13,704. "Improvements in or relating to electric cable conductors." W. E. HITCH. June 29th.

13,706. "Improvements in primary batteries." F. RICHMOND. June 29th.

13,715. "Process of and means for preventing oxidisable metals and the like from rusting after they are electro-plated." C. MASON. June 29th.

13,719. "Improvements in or relating to squirrel cage rotors for induction motors and alternators." J. C. B. IGLESY. June 29th.

13,730. "Improvements in telegraphy." E. KITSEE. June 29th. (Complete.)

13,733. "High voltage adaptor for electric incandescent lamps with metallic filaments." F. WISOTZKY. June 29th.

13,734. "Improvements in and relating to electrodes for electric furnaces, radiators, lamps and the like." G. CORNARO. (Date applied for under Sec. 91 of the Act, June 27th, 1907, being date of application in Italy.) June 29th. (Complete.

13,743. "Improvements in or relating to dynamo-electric machines." A. A. PIPER and E. F. AHLM. June 29th. (Complete.)

13,752. "Improvements in incandescence vapour lamps." A. KITSON. June 29th.

13,781. "Improvements in electrostatic machines for Röntgen rays, electrotherapy and space tel graphy." F. GHILARDUCCI. June 29th. (Complete.)

13,766. "Improvements in or relating to combination electric switches and fuses." H. T. HARRISON. June 29th.

13,772. "Automatic distributor for gas or electrically-controlled valve." P. BENARD. (Date applied for under Sec. 91 of the Act, July 12th, 1907, being date of application in France.) June 29th. (Complete.)

13,779. "Improvements in apparatus for the electro-deposition of metals electrolytic cleaning and the like." G. E. OSMOND. June 29th.

13,781. "Improvements relating to magnetic brakes." O. H. BALDWIN. June 29th.

13,787. "Improvements in and relating to electric meters." BRITISH THOMSON-HOUSTON CO., LTD., and F. W. CARTER and A. J. MARTIN. June 29th.

13,788. "Improvements in and relating to electric meters." BRITISH THOMSON-HOUSTON CO., LTD., and A. J. MARTIN. June 29th.

13,857. "Improvements in means for mounting on poles slotted hollow arms for supporting electric conductors in the open." T. BUCHHOLZ. (Date applied for under Rule 13, July 19th, 1907. An invention comprised in Application No. 16,577 dated July 19th, 1907.) June 30th. (Complete.)

13,842. "Disinfected mouthpiece and ear-cap for attaching to existing mouthpieces and ear-caps of telephones." A. C. GOOD. June 30th.

13,859. "Improvements in incandescent gas lamps provided with electric ignition." M. DELAGE and P. WOOG. (Date applied for under Sec. 91 of the Act, December 31st, 1907, being date of application in France.) June 30th. (Complete.)

13,863. "Electric socket shell." H. HUBBELL. June 30th. (Complete.)

13,865. "Improvements in electric signalling." R. A. FESSENDEN. (Date applied for under Sec. 91 of the Act, July 1st, 1907, being date of application in United States.) June 30th. (Complete.)

13,875. "Improvements in or relating to telephone apparatus." E. H. STOLZ and C. H. VIGGARS. (Date applied for under Sec. 91 of the Act, January 18th, 1908, being date of application in United States.) June 30th. (Complete.)

13,884. "Improvements in and relating to sparking coils particularly applicable for use with internal combustion engines." C. A. VANDERVELL. June 30th

13,893. "Improvements in switches." C. S. CHAMBERLAIN and D. HARRINGTON. (Date applied for under Sec. 91 of the Act, September 19th, 1907, being date of application in United States.) June 30th. (Complete.)

13,906. "Improvements in electric fuses." Z. B. V. HERWEG. June 30th. (Complete.)

13,924. "Improvements in lifting gear for overhead trolleys." A. W. METCALFE. July 1st.

13,927. "Non-corrosive carrier for electric accumulators or the like." H. T. WILKINSON. July 1st.

13,957. "Improved regulating device for electric circuits." F. RITCHIE. July 1st. (Complete.)

13,969. "Improvements in and relating to telephones." H. HADIDA. July 1st.

13,983. "Improvements relating to printing apparatus such as typewriting, stenographic, composing and telegraphic machines." L. CHAMBONNAUD. July 1st. (Complete.)

14,025. "New or improved coupling for electric wires." R. WINDER. July 2nd.

14,048. "Improvements in overhead electric traction systems." SIEMENS SCHUCKERTWERKE G.M.B.H. (Date applied for under Sec. 91 of the Act, July 3rd, 1907, being date of application in Germany.) July 2nd. (Complete.)

14,049. "Improvements in dynamo-electric machines." SIEMENS BROS. DYNAMO WORKS, Ltd., and M. KLOSS. July 2nd.

14,060. "Improvements in or relating to electric light switch setting." M. ROTH. July 2nd. (Complete.)

14,062. "Improvements in magnetic separation." G. ULLRICH. July 2nd.

14,066. "Improvements in or connected with secondary batteries." E. M. PRESTON. July 2nd.

14,090. "Improvements in electric heaters for liquids." BRITISH THOMSON-HOUSTON CO., LTD. (General Electric Co., United States.) July 2nd.

14,106. "Improvements in electrically operated rock drills specially applicable for stoping." J. KNIGHT. July 3rd.

14,116. "Improvements in telegraphic relays or receiving devices." I. KITSEE. July 3rd. (Complete.)

14,121. "Improvements in electrical vulcanising apparatus." J. HAY, H. R. COUPER, and W. H. LINDSAY. July 3rd.

14,124. "Self-locking catch pocket for receiving ownerships denoting tallies or tokens arranged for an electrical release." G. H. DENISON. July 3rd. (Complete.)

14,160. "Improvements in electric heating devices." THE BRITISH THOMSON-HOUSTON CO., LTD. (General Electric Co., United States.) July 3rd.

14,161. "Improvements in and relating to electrical power transmission systems." THE BRITISH THOMSON-HOUSTON CO., LTD. (Allgemeine Electricitats-Ges., Germany.) July 3rd.

14,183. "Improvements in metallic-filament lamps for a high intensity of light." W. MAJERT. (Date applied for under Sec. 91 of the Act, June 22nd, 1908, being date of application in Germany.) July 3rd. (Complete.)

14,184. "Improvements in process of cleaning metallic-filaments for electric incandescence lamps and giving them a more compact structure." W. MAJERT. July 3rd.

14,185. "Improvements in wireless telephony." R. KHABAROFF. July 3rd.

14,189. "Improvements in electric accumulators." H. LEITNER. July 3rd.

14,237. "Improvements in and relating to electric arc lamps." E. R. GROTE. July 4th.

14,252. "Improvements in Morse or other signalling lamps." G. R. LANGMAID. July 4th.

14,259. "Improvements in or relating to apparatus for preventing the theft of electrical energy." M. G. DIAZ and A. AZAROLA. July 4th. (Complete.)

PUBLISHED SPECIFICATIONS.

Copies of any of these Specifications may be obtained of Messrs. W. P. THOMPSON & Co., 322, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1908.

INCANDESCENT ELECTRIC LAMPS. J. W. Howell. 5,783. March 14th. (Date applied for under International Convention, March 16th, 1907.)

ELECTRIC CABLES. V. P. von Pindtershofen. 6,757. March 26th.

SHUTTLE ARMATURES FOR DYNAMO-ELECTRIC MACHINES. Firm of R. Bosch. 7,125. March 31st. (Date applied for under International Convention, March 14th, 1908.)